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Discussion paper

***PUBLIC-PRIVATE PARTNERSHIPS:
RISK ALLOCATION AND VALUE FOR MONEY***

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Public-Private Partnerships: Risk Allocation and Value for Money

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ABSTRACT

This paper reviews the literature on the allocation and valuation of public-private partnerships (PPPs). First, the paper discusses why governments pursue PPPs and how value for money (VfM) is achieved. Second, the paper reviews the principles of risk allocation and valuation from an academic and public sector perspective. Both the private and public sector consider risk allocation to be a critical issue with respect to PPPs and VfM generation, although governments adopt a less complex approach to risk measurement. This paper analyses papers, case-studies, and reports concerning VfM from PPPs and concludes that, from an academic perspective, the majority of PPPs do not create VfM (government reports usually reach the opposite conclusion).

KEYWORDS: Public-Private Partnerships; Risk; Risk Allocation; Value for Money

JEL CLASSIFICATION: G32; G38; H54;

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Public-Private Partnerships:

Risk Allocation and Value for Money

1. INTRODUCTION

Public-private partnerships (PPPs) are increasing in number worldwide and are used to build and manage large public infrastructure projects. PPPs enable countries, especially those with significant fiscal constraints, to initiate public asset construction while decreasing the fiscal burden during the investment phase (although this burden may increase at a later stage). PPPs incorporate private sector expertise and superior management to public sector projects with the aim of achieving higher levels of efficiency. However, concern exists with respect to the efficient use of public money in PPPs. There is debate surrounding the efficiency of PPPs in the realm of public procurement and, specifically, the value for money (VfM) effect of PPPs in the public sector.

VfM is defined in the literature as private sector services provided at a lower cost than the same quality and quantity of services provided by the public sector. The lower costs offered by private companies are achieved from greater efficiency (at least when compared to public organisations). Prior to the 2008 financial crisis, private sector finance costs were higher than the risk-free rate that the public sector traditionally applied. PPPs will only create VfM if there is private sector efficiency that sufficiently compensates for the price difference between the project's weighted-average cost of capital (WACC) and the risk-free rate (R_f). The efficiency advantage from the private sector affects the construction and operational phases of projects because superior management leads to lower costs, fewer delays, and reduced budget overruns. The efficiency advantage stems from the allocation and management of risk. Transferred risk is better managed by the private sector; therefore, costs are lower than they would be if managed by a public entity. Hence, the allocation of risk and appropriate risk valuation models are critical issues for PPPs.

This paper will address four questions. (i) How is risk allocated in PPPs? (ii) How is risk valued? (iii) Do PPPs create VfM? (iv) Is risk allocation essential to create VfM? With respect to the first question, risks should be allocated to the party best able to manage them and to achieve an optimal risk allocation. Determining how to achieve an optimal risk allocation is complex to verify; however, only an optimal risk allocation reduces costs and effectively manages incentives so that a PPP will generate VfM. In relation to the second question concerning risk valuation, our survey shows that studies and analyses are recent and limited in number. Although academics (unlike governments) use advanced research techniques (mainly value-at-risk (VaR), cash-flow-at-risk (CFaR), and real option analysis), research studies are few and limited in scope. Therefore, further analyses are required, and more detailed techniques must be considered. Our survey also shows that governments use basic tools to value risks. With the exception of South Korea (which uses a Black-Scholes model), most countries rely on value sensitivity analysis based on the capital asset pricing model (CAPM) or the equity risk premium. Despite frequent use of Monte-Carlo simulations, we believe that a government

qualitative approach ought to be complemented with more quantitative analyses. The risk assessment from the government perspective remains limited and may be a result of inexperience in the public sector, a lack of knowledge, or insufficient data.

We conclude, despite the limited literature, that both academics and practitioners unanimously agree that risk is fundamental for VfM; however, their agreement ends here. Most academic studies show that PPPs projects do not generate VfM. We demonstrate that academic papers focus on five main points of criticism, all of which are related to risk. Contrastingly, the majority of government reports conclude that PPPs create VfM, although some of these reports have obvious pitfalls. We provide evidence that government reports are biased in favour of PPPs and present possible explanations.

This paper is organised as follows. Section 2 provides an overview of the PPP concepts, VfM, and private sector efficiency. Section 3 reviews the academic literature and government guidelines on the allocation and valuation of risks. Additionally, this section provides insights on the risk-related behaviour of the different PPP parties and how the individual parties manage controversial risk. This section addresses the first and second research questions (i.e. how risk is allocated and valued). Section 4 reviews relevant papers, case studies, and government reports concerning VfM and risks and addresses the last two research questions: Do PPPs create VfM, and is risk allocation crucial in this context? Section 5 presents the conclusions.

2. THE CONCEPT OF PUBLIC-PRIVATE PARTNERSHIPS

2.1 What are PPPs?

A PPP has been defined as *'an agreement where the public sector enters into long-term contractual agreements with private sector entities for the construction or management of public sector infrastructure facilities by the private sector entity, or the provision of services (using infrastructure facilities) by the private sector entity to the community on behalf of a public sector entity'* (Grimsey & Lewis, 2002, p.[pg. 248]).

However, there are many definitions of a PPP in the literature.¹ The ambiguity exists because PPPs are a recent phenomenon (the first PPPs appeared in the UK in the early 1990s) and governments worldwide have taken different approaches to PPPs. Using the dimensions of control, funding, and ownership, Zarco-Jasso (2005) identify eight types of PPPs. PPPs are substantially different from full privatisation and, according to Vega (1997), the difference lies in the transfer of risk. In a privatisation, all risks are transferred to the private sector, whereas some risk from a PPP is retained by the public sector. Moreover, contractual arrangements are the core of PPPs (Demirag & Khadaroo, 2008) and extend over finite (but long) periods.

PPPs are mechanisms that blend traditional procurement and full privatisation (Grimsey & Lewis, 2005a). Boardman (2010) notes that PPPs combine government control and ownership with access

to private sector efficiency and capital. In a PPP, the private sector is responsible for constructing, partial financing, asset operations, and the service provision. Despite intensive use, it remains unclear whether PPPs lead to more efficient use of public resources; however, the 'infrastructure gap' implies that the long-term global prospects for PPPs remain strong. Understanding government motivation in the use of PPPs and their ability to enhance public sector efficiency is valuable for future PPP success.

2.2 Why do governments use PPPs?

Governments have increasingly employed PPPs in the last few decades to finance and manage complex operations. The additional private sector involvement has caused a reduction in public sector investment in new and old infrastructure development. Governments expect that private sector management enables a better allocation and a more efficient use of public resources. However, despite the intensive use of PPPs, their effectiveness is not unequivocal. Debande (2002) states that PPPs use private capital to build infrastructure, which may not otherwise be possible without private funds because of significant government budget constraints. Another advantage to PPPs is that public authorities can focus on strategic priorities and rely on the private sector to manage operations. This provides comparative advantage in terms of efficiency (provided the private sector has incentive). The main benefit of PPPs is private sector efficiency (from higher quality management) and a reduction in construction and operational cost deviations.

However, PPPs are often criticised as an 'off-budget temptation' for governments (especially when fiscal constraints are binding). PPPs can enable governments to make public investments and postpone the expenditures without compromising current budget and debt. However, PPPs can dilute political control over decision-making in the public sector. Bovaird (2004) argues that PPPs can undermine competition. Still, whether that issue is related to the structure of PPPs or the fact that the sectors in which PPPs are set up are low-competition is unclear. Other criticisms on PPPs have been raised: (i) the real levels of enhanced efficiency (Glaister, 1999); (ii) the level of accountability of PPPs (Broadbent & Laughlin, 2003; Froud, 2003; Asenova & Beck, 2010); (iii) the efficient government management of the (unavoidable) problem of incomplete contracting (Blanc-Brude, 2006) and, (iv) the level of VfM generation for the public sector (Grimsey & Lewis, 2002, 2005b).

This study addresses concerns with two fundamental questions: (i) Should the PPP be on or off the public sector balance sheet? (ii) Do PPPs yield VfM?

2.3 Should the PPP be on or off the public sector balance sheet?

Infrastructure development typically has two stages: construction and operation. The majority of infrastructure requires high levels of investments but low levels of annual operating and maintenance costs. Using highways in Portugal during the last 15 years, as an example, Sarmiento (2010) finds that construction costs amounted to between €3,000,000 and €7,000,000 per km, whereas annual operating and maintenance costs were approximately €75,000 per km. This shows

that the majority of the PPP financial outlay occurs in the first four or five years, during the construction stage. Therefore, accounting for this phase in the public budget is a key issue.

In traditional procurement, the investment is a public expenditure because it is recognised at the moment of payment, which affects the deficit and the national debt. In contrast, the majority of Eurozone countries consider the PPP as an off-balance sheet operation. Investments are considered as private because long-term construction and availability, or demand risk, are transferred to the private sector. Investments are not considered in the deficit and the debt during the construction years, placing the government in a better fiscal position. Future payments from the government to the private sector are recognised as expenditures, increasing the deficit in the payment years. This tendency has led many academics to criticise a PPP as an off-balance sheet temptation.

The temptation to deliver a public service through a PPP is a reflection of budget rather than efficient public procurement. The high levels of public expenditure for assets and services indicates that governments are concerned with public deficits to a greater extent than VfM. Hence, we conclude that governments use PPPs for a single purpose: to place certain public investment outside the public accounts. Figure 1 shows the tendency for countries with higher levels of public debt to use PPPs to a greater extent. This temptation is facilitated by the accounting mechanism that allows governments to build public projects and to simultaneously maintain public expenditure levels, taxes, and deficits by postponing PPP costs. However, problems regarding affordability may arise when the postponed payments emerge in the subsequent decades, as is the case with Portugal, Ireland, and Greece.

(Insert Figure 1 here)

2.4 Are PPPs value for money?

VfM provides the same quantity and quality of services at a lower overall cost (i.e. the whole-life cost required to meet the user's requirements) (Ball, 2007). Fitzgerald (2004) argues that VfM can be delivered through risk transfer, innovation, greater asset utilisation, and integrated whole-life management. Andersen (2000) mentions risk as only one of the six drivers of VfM; however, this paper demonstrates that risk is the most crucial of the six.

The private sector must be more efficient than the public sector because the public sector's borrowing costs are lower. Since 2007, the sequence of property, bank, and government debt crises has brought some concern with respect to this rule for a number of countries. As long as public sector interest rates are lower than those of the private sector, PPPs will generate VfM if private sector efficiency is greater than the difference in financial costs. After all, if:

$$R_f < R_d < R_e, \text{ then } R_f < WACC$$

then PPPs can generate VfM if:

$$\text{Efficiency gains} > (WACC - R_f).$$

where R_f , R_d , R_e , and $WACC$ stand for the risk-free rate, the cost of debt, the cost of equity, and the weighted-average cost of capital, respectively.

Debande (2002) and Quiggin (2005) add that the benefits of PPPs should compensate for the additional costs of recurring to private sector financing. The private sector has a higher discount factor for two reasons. First, the public sector faces lower risk because it does not default in the same way as private companies. Second, risks to the public sector are borne by the taxpayer. The risk premium is the market evaluation of the risk transfer to the private sector, and the higher financial cost forces the private sector to be more efficient.

The private sector is considered more efficient than the public sector because the former is subject to superior incentives towards cost-effective investments, to control operational costs and especially manage risks better. How to allocate risk and the choice of risk model assessment for PPPs are critical issues in private sector performance. Grout (1997) demonstrates that inappropriate risk allocation, in conjunction with a lack of competition, innovation, and transparency usually leads to PPP failure. Risk transfer improves the cost efficiency of PPPs and renders them more cost efficient than traditional procurement. An effective transfer of risk from the public to the private sector can lead to a more explicit treatment of risk because it is the acceptance of risk that provides motivation to the private sector to price and produce efficiently.

According to Sarmento (2010), the public sector comparator (PSC) prior to the bid is an effective measure for evaluating VfM because it enables the public sector to base decisions on a financial evaluation of alternatives. The PSC is the difference between the costs for the public sector of a PPP payment and the cost of building the asset or providing it through traditional procurement. The PSC is based on full cost, revenue, and risk estimates in cash flow terms, discounted at the public sector rate to determine the net present value (NPV), and compared with the discounted value of payments to the private supplier (considering the risks and costs retained by the public sector) (Grimsey & Lewis, 2005b). The PSC is, therefore, the cost difference between the two procurement options for the same project. Grimsey & Lewis (2005b) argue that the PSC is simpler and easier to compute than any of its alternatives. The PSC offers a cost-effective trade-off between a full cost-benefit analysis of all project options (conducted in Germany) and the selection of the best private bid (the method used in France). The PSC ensures that all options are subject to the same analyses and tests. The PSC should be calculated prior to evaluating bids for two reasons. First, the PSC will be evaluated as a 'pure' public sector option and, second, it enables the public decision maker to understand the VfM elements that the private bid should reflect. Therefore, it is important to maintain a current PSC. The PSC becomes a negotiating tool for the public sector, enabling it to achieve the best possible deal.

The PSC should provide the base for costing. It represents a fair estimation of all costs, for the same level of volume and quality that the public sector would provide.

Once the NPVs of both the PSC and the PPP are adjusted to reflect comparable bases, they can then be compared. *Ceteris paribus* (i.e. with respect to quality and risk allocation), VfM is generated when the total present value of the cost of private sector supply is less than the NPV of the base cost of the service, adjusted for the cost of retained government risk, transferable risk, and competitive neutrality effects.

However, the PSC is liable to potential pitfalls in the forecasting cash flows and choice of an appropriate discount rate (Froud, 2003; Shaoul, 2005). Grimsey and Lewis (2005b) add that the risk analysis required for the PSC is part of a broader process of risk identification, allocation, and management. In many cases, the difference between the PSC and the private sector proposal will be relatively narrow and the procurer has to make professional judgments as to the VfM to be derived from contracting with the private sector and the risks which that route involves.

3. PPPs AND RISK

This section presents an overview of the academic literature and government guidelines concerning risk allocation that is central to achieving VfM from PPPs.

Risk management with respect to PPPs is a potential factor contributing to efficiency (Glaister, Scanlon, & Travers, 2000). It consists of a structured approach to the identification, assessment, and control of risks that emerge during the policy, program, or project lifecycle (HM Treasury, 2003a). The identification of the source of risk is required to effectively manage risk.² Additionally, the responsible party for risk at each project stage and the management strategy for minimising the potential negative consequences of the risk during the entire project life must be determined (McDowall, 2003). Investment projects are vulnerable to behavioural biases: managers are concerned with the size of potential losses to a greater extent than the likelihood of a loss occurring (Helliar, 2001).

In this section, we analyse how the three main parties in a PPP (the government, the private companies, and banks as lenders) address risk.

3.1 Risk and the PPP actors

The three main parties involved in a PPP are the public sector (the public entity that grants the service), a private company, and the private bank sector. Each partner holds a different perspective with respect to time, risk, and decision making (Forrer, Kee, Newcomer, & Boyer, 2010), especially concerning the identification, analysis, quantification, and allocation of risk. The different motives, goals, and values of the involved parties require successful cooperation and interaction and a high level of trust between the players.

3.1.1 The public sector perspective with respect to risk

There have been several developments in the PPP concept of risk. First, several innovations have been introduced in the field of risk identification, allocation, valuation, and management (Shaoul, 2005). Second, the public sector has a fixed payment schedule, which reduces financial risk. This fixed payment does not guarantee that there will be available resources in the public budget for these costs. However, a fixed payment schedule is an advantage because the guaranteed and stable prices

(even if higher) cater to public sector risk aversion. Third, the law of large numbers applies to the public sector with respect to risk as a probability. This advantage is also at the centre of the public sector's optimism bias, often presented as a criticism. The optimism bias implies that the public sector accepts a lower probability of a negative event compared to other sectors. It can also be considered as systematic bias by appraisers in the over-estimation of a key project's parameters. There are several reasons for this bias. Optimism is common in the public sector because the sector often suffers from poor management and inadequate information. However, the main reason for the bias is that losses are borne by the taxpayer, whereas they are borne by the shareholder in the private sector.

The use of PPPs also entails certain disadvantages (for the public sector). PPPs reduce the public sector's power in addressing changing needs and circumstances (Quiggin, 2005) because there is limited opportunity for the renegotiation of contracts (following the principle of *pacta sunt servanda*). Additionally, even in cases where a renegotiation of a contract is possible, the private sector has a significant advantage from information asymmetry. Another criticism in literature is the paradox of infrastructure investments (Gleason, 1995). The paradox stems from the high risk associated with high returns because, as noted by Esty (2004), the sponsor may appear to profit excessively at taxpayer expense. Excessive private sector profits can generate an aversion to investment through PPPs.

There is a perception that the public sector carries a lower level of risk than the private sector with respect to investment and financing choices (Sarmiento, 2010). Public sector investments have not, historically, distinguished between investment and financing decisions: investments are frequently undertaken when credit is cheap and abundant, although the investment decision should consider opportunity cost (i.e. whether there is no better alternative use for taxpayer money). Consequently, the minimum hurdle rate that the public sector employs is often lower than that of the private sector, a situation exacerbated by public sector consideration of variables such as public interest, economic externalities, and social assistance in addition to maximum value. Brealey, Cooper, and Habib (1997) question whether governments view public sector projects as low risk, or whether governments consider that projects are low risk because they are undertaken by the public sector. The authors show that the evaluation of the investment should be independent of the financing source. The fact that the public sector usually has a lower interest rate should be irrelevant in the evaluation of a project. Too often, countries approve projects because there are available resources and not because of their economic or social value. Because PPPs have no impact on the public deficit during the investment phase, they have become an off-budget temptation. Hence, not separating the investment and financing decisions has led to a myopic perspective by the public sector with respect to investment and a misjudgement of risk.

Successful public sector risk management requires a proactive rather than a reactive approach. PPPs force the public sector to examine risk in alternative ways than traditional public procurement. Private sector experience with risk and greater incentive to deal with risk implies a private sector advantage when negotiating with the public sector. The next subsection explains why the private sector is efficient in managing risk.

3.1.2 The private sector's perspective on risk

The private sector has traditionally been better prepared to deal with risk for two reasons: (i) the private sector exhibits no optimism bias concerning risk. Such bias would increase bankruptcy risk and, (ii) private sector project financing is conducted with substantial experience in risk estimation and management. Two private sector players are involved in PPPs: the company (and sponsors) and the lender. How they behave towards risk, with each other and the public sector, is analysed in this subsection.

Sponsors of PPPs are investors who are responsible for the project and the equity capital. Because a PPP is developed under project finance rules, sponsors only receive the return on their investment in the final stage. Project finance has a cascading cash flow, whereas revenue distribution follows a specific order: operating and maintenance costs, taxes, debt services, and equity returns. Therefore, sponsors assume the highest financial risk and require a higher return on equity than the cost of debt. However, if the project defaults, they lose the capital they invested. From the sponsor's perspective, the low level of equity does not imply a higher propensity for risk.

From a private capital perspective, the high scale of investment, delayed payback period and maturity, and the various risks involved can make a project extremely risky. Usually, lenders show greater concern for risk than sponsors because PPPs rely on debt to a greater extent than equity. Esty (2004) shows that debt on PPPs represents 70 to 90% of the investment, which is three times more than traditional corporate financing companies. Because banks assume the majority of the financing, their risk aversion increases and they are eager for the project to assume as low a level of risk as possible.

Banks are involved in the early phases of projects. They gauge projects to ensure acceptable risk levels and sufficient project cash flows for the debt service (Asenova & Beck, 2010). Lenders are concerned with the level of risk transfer to the PPP and the reallocation of risk to third parties. Lenders would prefer that the PPP resemble an 'empty box' in terms of risk (Yescombe, 2011) and have become reluctant to accept any but the most limited and measurable risk. If a project is low risk, it enables the bank to lend greater amounts at a low interest rate. Therefore, the difference between the WACC and R_f may not be that high. Consequently, the private sector's efficiency should be sufficient to overcome the difference and generate VfM. Lenders bear the financial and bankruptcy risks and, if project revenues fall below estimates (or in the extreme event that the project defaults), lenders are not repaid. However, the low likelihood of such an event enables banks to support projects under suitable conditions.

3.1.3 Summary of risks and PPP parties

The three main parties in PPPs possess different goals: the public sector, the private companies, and the lending banks. The public sector is concerned with VfM and efficient public spending, whereas the private sector (i.e. the private companies and the lenders) is profit-oriented. Different players

with different objectives have a different perspective on risk. The public sector has a different approach to PPP risk than traditional public procurement. Additionally, the public sector has an 'optimism bias', making it less efficient in the management of most of risks. PPPs bring innovation in the management of risks by separating investment and financing decisions and that public sector only have lower interest rates because the taxpayer's support losses.

The banks minimise bankruptcy risk and participate in the risk allocation process. Low operational risk reduces the financial costs, which increases the potential to create VfM. However, as the investment and financial decision, in many cases, is not separate, suitable financial conditions often encourage governments to invest in suboptimal projects.

This follows from the fact that the private sector has higher standards concerning investment conditions because the private sector experiences higher default risks and potential losses. Lower project risk can be achieved in two ways: either the company transfers the risks to third parties or the government guarantees a portion of the risk. Therefore, projects can possess high leverage without assuming a high level of risk.

3.2 Risk Allocation

The higher financial costs of the private sector must be compensated for by greater efficiency in operations and risk management to obtain sufficiently high VfM. The optimal risk allocation reduces the economic cost, provides incentive for sound management, and reduces the need for future renegotiation (Asenova & Beck, 2010). A UK survey, (Li, 2005) finds that risk allocation is the first priority for the private sector, whereas it is a secondary priority for the public sector following the overcoming of budgetary constraints.

3.2.1 Risk allocation in the PPP literature

The academic literature considers three risk allocation factors: 1) risk classification, 2) the general allocation of risk, and 3) the allocation of specific risk.

Risk can be categorised in several ways: (i) endogenous versus exogenous risk (exogenous risk cannot be controlled); (ii) commercial risk (allocated preferably to the private sector) versus legal and political risk (usually allocated to the public sector) (OECD, 2008); (iii) development phase risk (planning and construction), the operation and transfer phase risk, and the lifetime phase (political, financial, environmental, and force majeure risks) (Jin, 2010) and, (iv) risks at the macro-, meso- and micro-level (Bing, Akintoye, Edwards, & Hardcastle, 2005a). Macro-level risks are exogenous and are composed of country/industry risk in addition to acts of God. Meso-level risk includes endogenous risk but occurs within project system boundaries such as those concerned with construction, demand, and technology. Micro-level risks are assumed by stakeholders and are party-related (rather than project-related).

Risk allocation complexity arises because the contractual arrangement is achieved through a bargaining process (Medda, 2007). The literature examines whether the risk allocation advantages lead to biased conclusions concerning PPP adoption at the expense of traditional procurement. The criticism is that PPP efficiency is predominantly a result of the pricing of risk in the PSC and from the perceived cost overruns that occur under conventional public investment (Sawyer, 2005). This is discussed in the following subsections.

The majority of PPP risk can be allocated simply: risks can be retained by the public sector, transferred to the private company that manages the PPP (which could opt in turn to reallocate risk to third parties), or shared between public and private parties.

Certain risk is always borne by the public sector (e.g. political risk such as unilateral change in contracts or changes in sector legislation, regulation related to archaeological finds and fossil discoveries, and acts of God). These risks almost always remain with the public sector because they cannot be controlled and could lead to project default. If the private sector were to take responsibility for such risks, it would expect a high financial premium, which would undermine the VfM concept. Other types of risk (related to construction, operations, and maintenance) are always transferred to the private company. This transfer has a minimal level of risk because below this level there is little incentive for private sector efficiency and, therefore, for VfM generation. The allocation of other types of risk such as planning, environmental, demand, and interest rate risk are allocated to other parties and are summarised in Table 1 .

Demand risk should be allocated to the private sector for several reasons. Demand risk management requires additional effort and efficiency from the private sector (Chung, Hensher, & Rose, 2010). The private sector understands how to attract users and how to calculate demand elasticity. The private sector is better equipped to accomplish commercial tasks.

Because finance risks are economic risks associated with project finance, some researchers believe they should be allocated to the private sector. Interest rate and financial market risk representing project finance economic risk should also be allocated to the private sector. PPPs are essentially a project finance scheme with non-resource debt. This implies that the banks will lend money based solely on the project's future cash flows. Allocating financial risk to the private sector prompts the PPP to pursue sound risk management. Because financing is the greatest cost, the private sector is motivated to minimise it. Finally, the private sector is more familiar and experienced with financial markets than the public sector (Bing et al., 2005a). However, some authors (e.g. Wang, 2000) consider that traditional public sector borrowing rates are lower than private sector borrowing rates and that this risk should be shared by government guaranteed private sector financing.

(Insert Table 1 here)

3.2.2 Risk allocation in governments reports

Governments view PPP risk allocation as critical for VfM. Some public authorities have created PPP manuals, and Table 2 summarises their perspectives on risk. These manuals provide guidelines and

procedures for government departments involved in PPPs and identify the steps necessary to achieve VfM. The guidelines intend to ensure that the PPP process is homogeneous across government departments to enhance transparency and objectivity in PPP management.

The government reports presented in Table 2 identify the risks that should be retained by the public sector, the risks that should be transferred to the private company, and the risks that are subject to negotiation between the private and public sector. The manuals also consider the PSC as a risk adjustment cost. The risks are assessed individually, subjected to sensitivity analyses, and aggregated in NPV terms. Some manuals also contain risk contingency plans and guidelines in case the public sector is forced to reassume risk.

Government efforts to address risk allocation are undermined by the off-balance sheet temptation. Therefore, many PPPs incorrectly allocate risk because the projects must be incorporated into PPPs to avoid fiscal constraints and not because of the process itself. The need to invest through PPPs to avoid budget constraints leads to incorrect risk allocation, which undermines VfM.

(Insert Table 2 here)

3.2.3 Summary of PPP risk allocation

The PPP literature focuses mainly on the risk allocation process. Accurate insight into the various types of risk is central to VfM. The risk allocation process may be misused to exploit PPP advantages over traditional procurement. Without accounting for risk transfer, traditional procurement may appear cheaper than PPPs. The governments that adopt PPPs have developed guidelines for the retention, transfer, and negotiation of risk. Additionally, governments provide risk allocation and valuation guidelines. The next subsection addresses the valuation of risk.

3.3 PPP risk valuation models

PPP risk is similar to traditional project risk. The typical project finance evaluation methods are employed to value PPPs, although each type of risk should be individually evaluated before aggregation with other types of risk. Additionally, each type of risk should undergo a sensitivity analysis to determine the robustness of the forecasts and the business plan.

The combination of both qualitative and quantitative methods (often in combination with a Monte-Carlo analysis) has been proposed for risk valuation (Tanaka, 2005).³ However, a Monte-Carlo simulation is only appropriate if there is sufficient, quality data, otherwise simple probability methods are sufficient (Grimsey & Lewis, 2005b).

No consensus exists in the literature concerning the optimal discount rate to calculate present value (Sarmiento, 2010). Two conflicting theories are apparent: (i) public projects bear minimal risk and require the risk-free discount rate (or a governmental borrowing rate) and, (ii) public projects require a private sector discount rate (Arrow & Lind, 1970) and (Mehra & Prescott, 1988). Brealey et al. (1997) argue that the discount rate for government projects equals the expected return in the capital

markets for comparable investments, that is, the opportunity cost of capital for the private sector. The discount rate can have an overwhelming influence on the NPV. Sarmento (2010) studies seven highway projects and shows that the sum of the NPV of these PPPs drops by more than one billion Euro (from eight billion to under seven billion) if the discount rate augments from 4.5% to 6%.

Academics apply a wide variety of more sophisticated techniques (Table 3) in contrast to the governments who usually stick to simple valuation methods such as discounted cash-flows (see Table 4).

VaR has gained in popularity as it measures the risk of losses in a specific portfolio of financial assets. VaR is defined as the maximum potential loss (given by a certain confidence level, eg: 95% or 99%) which faced by a portfolio or financial institution within a certain period. For example, a VaR of a trading portfolio of 50 million in a specific currency at a 99% confidence level implies that there is only one chance in 100, under normal market conditions, that a loss greater than 50 million will occur. This number summarises the portfolio's exposure to market risk, the probability of loss and the level of risk in that specific currency. It also provides an aggregated portfolio risk that accounts for leverage, correlation, and current position. The method can be broadly applied, from market to other types of financial risk (Jorion, 2006). The method is used for risk management, financial control, and reporting.

Some researchers question whether common credit risk evaluation models are suitable for PPPs because of specific project finance characteristics (Esty, 2004). Gatti, Rigamonti, Saita, and Senati et al. (2007) argue that applying VaR to project finance in the same way as traditional corporate financing is not possible. VaR is mainly used for financial portfolios, and PPPs are usually conducted in a non-financial industry context. An alternative is the Cash-Flow at risk (CFaR) approach that assumes uncertain future cash flows and thus a more realistic approach. However, instead of using a single NPV, this approach yields a range of expected values. CFaR represents the cash that would be received or paid from a portfolio of transactions with a likelihood of certainty within a specific time horizon. Earnings-at-risk (EaR) is another approach similar to the CFaR that uses a cash base to estimate earnings and expenditures instead of cash flows and adopts an accrual perspective.

(Insert Table 3 and 4 here)

Ye (2000) and Sudong and Tiong (2000) developed a new method called NPV-at-risk, which combines the cost of capital, measured by WACC, and dual risk return methods. This method allows the correlation and measuring of risk and return. NPV-at-risk represents the minimum expected NPV at a specific confidence level (e.g. 95%). It involves the determination of the discount rate and the generation of the cumulative distribution of possible NPVs. The authors argue that NPV-at-risk can lead to superior decisions concerning the risk evaluation of infrastructure projects. Other authors (Cheah & Jicai, 2006; Alonso-Conde, Brown, & Rojo-Suarez, 2007; and Takashima, Yagi, & Takamori, 2010) introduced the concept of real options in evaluating PPP risk. Real options consist of a proactive approach in managing uncertainty.

Whereas the proposed valuation methods are presented in the academic research, Table 4 shows the valuation methods of governments for PPPs. Governments prefer a qualitative approach based on nominal or descriptive scales that describe the likelihood and consequences of specific types of risk. Traditionally, the public sector has often used a risk probability assessment (to determine the likelihood of a risk occurring) and a risk impact assessment (to determine the potential effect of a risk event) in a straightforward way, possibly because of the public sector's inexperience, lack of knowledge, insufficient data, and complexities in defining risk in terms of likelihood and impact. Broadbent, Gill, & Laughlin (2008) report a recent trend towards more quantitative risk evaluation.

The Australian government uses the CAPM with a discounted cash flow (DCF). The CAPM is a frequently used risk-return model and was independently introduced by Treynor (1961), Sharpe (1964) and Lintner (1965) and builds on the earlier work of Markowitz concerning the diversification and modern portfolio theory further developed by Black (1972). The CAPM is based on restrictive assumptions concerning transaction costs and asymmetric information. Ross (1976)⁴ suggests a different model, the arbitrage pricing model (APM) that offers no arbitrage opportunity. The market risk of any asset is provided by the betas of the factors that affect all investments. The Australian government also applies a risk model using Monte-Carlo simulation.

The UK government sets a risk premium using Monte-Carlo simulation. (HM Treasury, 2003a). The fact that the UK government uses a more complex analysis is not necessarily a reflection of more sophisticated or less controversial risk valuation methods because such methods do not appear to capture all of the risk values in the risk transfer.

The South Korean public sector uses the Black-Scholes option pricing model to examine whether the returns to private participants are appropriate for the risks that they bear. A project is valued as an option and the payoff is a function of the value of an underlying asset. The minimum revenue guarantee is interpreted as a private participant put option on the toll revenue, and early termination is a put option on the project. This method enables the public sector to examine and value the risk for all parties involved in the PPP. It allows the estimation of fair returns based on the contractual returns of the private participants. The benchmark for the private sector premium is the five-year government bond yield. However, this model requires a complex analysis with additional data requirements and the South Korean government remains in the early stages of the Black-Scholes method.

4. EMPIRICAL ANALYSES OF PPP, VfM, AND RISK

Although PPPs have increased in recent decades, there are doubts concerning their efficiency. Academics and governments have performed studies to examine whether PPPs yield VfM (Hodge & Greve, 2009).

This section reviews the evaluations of PPP VfM by academics and the public sector (governments and audit court reports) over the last 15 years. We address the last two research questions of this

paper: Do PPPs create VfM, and does risk play a fundamental role in VfM generation? The majority of the research that we surveyed concludes that PPPs do not generate sufficient VfM and, therefore, questions their efficiency. Contrastingly, governments and audit courts present a positive picture of PPP VfM.

We searched academic journal databases from the year 2000 and gathered book chapters and studies that were presented at academic conferences. We retained the papers that performed an evaluation of VfM in PPP projects. The research focused on the UK and Australia; therefore, we compare these results with the government information and audit court reports from these two countries.

4.1 Academic case studies

Whether risk plays a fundamental role in VfM generation can be briefly addressed. This is because the majority of academics (as well as the government and audit court reports) are unanimous that risk is the central factor (perhaps the most important factor) in the generation of VfM from PPPs. Whether PPPs create value is considered from a negative perspective by the majority of authors (see Table 5).

(Insert Table 5 and 6 here)

Academics provide five main explanations for the lack of sufficient VfM generation by PPPs (Table 6). First, the private sector assumes limited risk and has thus few incentives to pursue superior management and efficiency. Second, risk is an ambiguous and complex concept with accompanying valuation uncertainty. Third, the methods used to value risk are incomplete. Fourth, the PSC favours PPPs because of optimism bias or the use of artificially low discount rates. Finally, PPPs often exhibit VfM only after risk transfer, which closes the gap between the PSC and PPP.

Risk transfer is used to render PPPs an advantageous solution. Several authors conclude that without accounting for risk transfer, traditional procurement or the PSC is cheaper (Pollock, 2002). The efficiency gains from PPPs appear to rely on the pricing of risk transfer or in the expected overrun of costs in the public sector (Sawyer, 2005). Hood, Fraser, and McGarvey (2006) also state that many critics of PPPs have argued that the government has overemphasised the risk that the private sector truly assumes. Ball (2007) shows that when risk transfers are not considered, VfM is negative. To illustrate why negative VfM occurs, we use the following example. Suppose a PPP faces the PSC cost in NPV terms. This implies that to generate VfM, a PPP should meet the following restriction (in NPV terms):

PPP payments < (PSC cost of construction + PSC operation and maintenance costs + risk transfer to the private sector).

When the risk is transferred to the private sector, the NPV of the PPP payments becomes higher than the NPV of the PSC construction plus the operating and maintenance costs. Most academics conclude that the PPP is an inferior option in public procurement.

The debate is expected to continue, at least until the entire life-cycle of sufficient projects has been studied in detail (Ng & Loosemore, 2007). Many projects remain in the early stages, and VfM can only be properly evaluated over the long term (Nisar, 2007; Weihe, 2008; Hodge & Greve, 2009). A greater number of detailed academic studies are required to overcome the gap between theoretical knowledge and practical experience. Academics do not consider PPPs an effective and efficient alternative to traditional procurement, whereas governments reach the opposite conclusion. These varying opinions require further analysis.

4.2 Public sector reports

The public sector perspective concerning PPPs is drawn from government reports and reports from the Court of Audit or National Audit Offices. Governments are an actively involved party, in contrast to academics and audit courts. Therefore, the conclusions drawn from government reports must be considered with caution. Audit courts are independent. They scrutinise government action and decisions to sanction poor decisions by public managers or to provide recommendations for the appropriate use of public resources. We separate the public sector reports in Table 7 into government reports (Panel A) and audit court reports (Panel B). We refer to Table 7 as we attempt to address the last two research questions: Do PPPs generate VfM? Does risk transfer play a key role in VfM generation?

(Insert Table 7 here)

The majority of government reports conclude that PPPs generate VfM. Although most audit court reports reach the same conclusion, they are conservative in concluding that a PPP yields VfM. A cross-country report shows that the UK government appears the most enthusiastic concerning PPP efficiency.

UK government studies (Table 7) cover a range of projects and sectors and compare a PPP with traditional procurement in terms of performance. All four UK government studies that we surveyed concluded that PPPs generate VfM. The conclusion was based on within deadline and budget PPP project delivery, unlike traditional procurement. Governments assess a PPP's efficiency in relation to alternatives and do not state whether a PPP leads to a Pareto optimal solution. Two of the UK government studies were sector specific (public schools) and focused on the significance of risk in generating VfM. Three Australian government studies used the same approach as the UK studies and drew the same conclusion (PPPs are more efficient than traditional procurement). We also examined 13 audit court reports from the UK and four from Australia. These reports raise concern with respect to the efficiency of PPPs. Some PPP projects effectively and efficiently achieve goals, whereas others do not. Thus, overall, the courts have a mixed perspective concerning PPP ability to generate VfM.

The arguments for and against PPPs in public sector reports are listed in Table 8. The main reason for support of PPPs is their efficiency compared to traditional procurement. Efficiency is defined as the timely and within budget delivery of services. Moreover, PPPs deliver the contracted results (although traditional procurement also does so using third-party contractors). The experience curve

of the parties involved is another factor encouraging PPP support. Two decades since PPP first emerged, the processes are more efficient because the public and private sectors have gained experience. Finally, PPPs eliminate some risks to public sector. Contrastingly, traditional procurement does not eliminate risk but merely transfers the responsibility to taxpayers. The risks may be less visible, but they are still present.

Arguments exist in opposition of PPPs, some originating from the public sector and especially by the audit courts. VfM depends almost exclusively on risk transfer, and any conclusion concerning VfM is subjective. Some argue that the private sector bears limited risk, whereas the public sector bears more risk than it should. A final argument by the audit courts is that PPP evaluation is not entirely independent, especially when conducted by governments.

(Insert Table 8 here)

The public sector has two arguments in support of PPPs. First, because the public sector is less efficient, building an asset or providing a service using public administration resources is expensive. Second, PPPs reduce uncertainty for public managers because the cost and output are known ex-ante (although this argument may be undermined by potential frequent renegotiations and financial rescues). The main criticism is that PPPs only generate VfM following risk transfer. The VfM, in the calculation of the PSC as opposed to the PPP payments, is the value of the risk transfer that balances the PSC cost in favour of the PPP. Relying on risk transfer to assure VfM is controversial. Andersen (2000) and the UK National Audit Office (2003) state that PPPs, after risk transfer, have exhibited VfM although their conclusions may be biased.⁵

Academics conclude that PPPs do not generate VfM, as shown in 25 out of the 40 papers that we analysed. The remainder is unsure whether PPPs can generate VfM (eleven papers) or are certain that PPPs do yield VfM (four papers). Government researchers, however, mostly conclude that PPPs generate VfM, as shown in six of the seven studies we reviewed (one study was inconclusive). Audit court researchers are divided; 7 of 17 studies show that PPPs generate VfM, seven do not, and three were inconclusive.

We find that academics and governments agree that risk transfer is central to achieving VfM with respect to PPPs; however, they disagree whether PPPs generate VfM. We discuss the biases from the public and private sector perspectives in the following subsection.

(Insert Table 9 here)

4.3 Study limitations

Academics, governments, and audit courts agree on the critical role of risk in VfM generation; however, their diverging opinions concerning PPP ability to generate VfM are surprising. The divergence is caused by several factors. First, PPP evaluation is complex because evaluations are time specific and, to date, no PPP project has completed the operational phase. Even the oldest PPPs (initiated in the early 1990s) have not yet completed their life-cycle, and most projects have not yet

reached maturity. Therefore, it is not possible to evaluate an entire PPP process. Second, government studies are based on a single PPP or country, whereas academic studies involve the study of a larger number of PPPs. Third, the level of experience with PPPs differs according to country: the UK has initiated more than 100 PPPs and Portugal, Spain, and South Korea have initiated more than 40 PPPs each (Araújo, 2010). Other countries are just beginning to use PPPs. Fourth, benchmark studies on traditional public procurement are required to evaluate PPPs, but limited research exists on this topic (with the exception of Flyvbjerg, 2002; Pickrell, 1990; and Fouracre, 1990). This gap in the literature adds complexity to the measuring of public sector inefficiency and its comparison with the real cost of PPPs. Fifth, academic studies suffer from limited data, whereas government agencies have access to richer data (Hodge & Greve, 2009). Sixth, some studies mix the investment decision with the finance decision. There are cases where governments identify assets to be built using limited economic or social rationality. Seventh, academic evaluations may be more objective with an independent viewpoint (known as the arm's length principle for PPPs (Boardman and Vining, 2011) compared to governments and even audit courts (that tend to focus on legal issues rather than performance). Additionally, academics use superior valuation methods than the public sector. Eighth, government analysis and risk management may be subject to optimism bias that can cause the public sector to be vulnerable to risk.

4.4 A cross-country comparison: the UK and Australian experience

The majority of PPP studies originate from the UK or Australia. Although these studies address different project types (e.g. schools, prisons, health care institutions), some are comparable in terms of scope (Panel A, Table 10). These studies differ in terms of methodology (Panel B of Table 10). Government studies compare traditional procurement costs with those of PPPs, or the real and estimated PPP costs of the base case, whereas academic researchers base their findings on case-studies and surveys.

(Insert Table 10 here)

The UK studies by Macdonald (2002) and the National Audit Office (2003) that compare the PSC (or the real cost to the public sector) to PPP cost, conclude that VfM has been generated. Studies for Australia by Group (2007) and Forum (2008) find similar results. A UK study on PPPs for schools that was based on surveys of the project stakeholders also shows VfM.

These government findings may be biased because they reflect individual perceptions, which may focus on quality and availability and not on costs and risk transfer. These studies compare the present solution (PPPs) with that of the past (public procurement), but do not compare PPPs with the most efficient theory, model, or existing solution.

Shaoul (2005) presents a VfM methodology for the UK health sector that determines the risk transfer and compares the cost of the PSC with PPPs. The study concludes that PPPs are more costly than the PSC before risk transfer. The author shows that VfM was based solely on risk transfer (a vague and subjective basis). The National Audit Office (2010b) compares the real costs with the estimated,

original contract costs for the health sector, but this analysis does not study VfM, unless the original contracts themselves have shown VfM.

Group (2007) and Forum (2008) conducted comprehensive studies in Australia on PPP projects by comparing the costs between PPPs and public procurement. The assessment on PPP VfM is positive, and the studies show that public investment is more costly with time and budget overruns. Contrastingly, English (2003) reviews performance audits in Australia and finds that PPPs do not generate VfM. The different methods used in these studies make the results difficult to compare. Only a few audit reports used in English's (2003, 2007) work are available and are based on the pre-contracting stage. The reports focus on the performance of the contract benchmark with best practices. The audits do not compare the alternative public sector 'state of the art'. It should be noted that the conclusions of these government reports and English (2003) is not totally contradictory: English (2003, 2007) concludes that PPPs do not perform well, but Group (2007) and Forum (2008) conclude that they perform better than traditional procurement. PPPs can underperform and still be a better solution than traditional procurement. However, we cannot draw a definite conclusion for the Australian case based on our review.

We find diverging distinctions among the conclusions in the 64 studies reviewed. Overall, academics are sceptical concerning PPP ability to generate VfM, whereas governments and audit courts are more confident concerning PPP efficiency.

5. CONCLUSIONS

Governments use PPPs for two purposes: to remove public investments from the balance-sheet and to generate VfM. A PPP creates VfM when it provides the same level of service quality and quantity at a lower overall cost than traditional public sector procurement. Because private sector financial costs are traditionally higher than those of the public sector, PPPs face a financial disadvantage. Therefore, VfM from PPPs must originate from greater efficiency provided by the private sector, an efficiency that must compensate for the sector's higher financial costs. The private sector is more efficient because there are built-in, performance-oriented incentives and economies of scale. PPP efficiency is a result of investment and operational cost and superior risk management.

This study addressed four research questions: (i) How should risk be allocated in PPPs? (ii) How should risk be valued? (iii) Do PPPs create VfM? (iv) Is risk essential for value creation?

With respect to the first question, we find that risk is crucial for VfM. Although the three main parties in a PPP (the government, the company, and the bank as lender) possess their own objectives, the three parties must be aligned concerning the allocation of risk. Academic researchers express concern for risk allocation, and some consider that VfM is used to make PPPs appear more advantageous. However, governments focus on providing guidelines to public departments concerning risk allocation.

With respect to the second question, we document that the public sector usually adopts simple valuation tools that are often based on a qualitative approach. Contrastingly, academics usually employ methodologies such as VaR, NPV-at-risk, CFaR, and real options. NPV-at-risk and CFaR are appropriate to apply in a PPP context. However, the academic literature on this issue is limited only in terms of quantity and because existing studies use only one technique or consider a single project.

To answer the third and fourth questions, we examined PPP evaluation by academics, governments, and audit courts. We examined the paper, government report, and audit report conclusions in terms of VfM generation and risk management. All parties provide a positive answer to the fourth question; however, they report diverging conclusions for the third. Academics are sceptical concerning PPP ability for VfM generation, whereas governments are not. Academic scepticism (related to risk transfer) is based on the following. First, the PSC favours PPPs because PPPs only generate VfM following risk transfer. The private sector bears limited risk and risk valuation is an ambiguous concept. The public sector claims that PPPs create VfM because they are more efficient than the alternative public procurement and because PPPs reduce uncertainty.

All the studies we reviewed, however, have several limitations. First, PPPs are a convoluted system involving different parts and specific technicalities. Additionally, PPPs worldwide are either incomplete or have not yet reached maturity. Second, studies are based on a single PPP or country. This is an important issue because the PPP experience differs substantially according to country. Finally, studies lack objectivity and data.

Are the results we found contradictory? Somehow yes, but limitations, different methodologies, and a lack of meta-analysis causes conclusions that are vague and imprecise. Therefore, additional country studies with complete methodologies, risk evaluation tools, a greater number of projects, richer data, and longer study periods are required. Further research can clarify PPP ability to generate VfM and their degree of efficiency using public resources.

Notes

1. Among others: HM Treasury (1998), Linder (1999), Osborne (2000), Savas (2000), Klijn (2000), European Commission (2003), Akintoye, Beck, and Hardcastle (2003), Bovaird (2004), Corner (2006), OECD (2008), Hodge and Greve (2009).
2. According to Kwak, Yingyi, and Ibbs (2009), no risk is applicable to all PPP projects and there is no consensus on a universal risk classification approach. The authors provide a comprehensive list of investment project risks. A similar list is found in Tinsley (2001) and a lengthy, descriptive list of risk is found in Akintoye (2001).
3. See Savvides (1994), Raymar (1997), and Moreno and Navas (2003) for a technical note on the use of this tool and Javid and Seneviratne (2000) and Gatti et al. (2007) for the use of Monte-Carlo simulation in PPP risk. For government use of Monte-Carlo simulation see HM Treasury (2003c).
4. This is developed in Roll and Ross (1980).
5. However, Andersen's (2000) study, which is frequently cited in defence of PPPs, has pitfalls. First, Andersen only analyses 7% of the total number of projects (28 out of 400). Second, risk accounts for 60% of total savings. Third, 80% of the savings account for a single project that was run by a company with close ties to Andersen at the time. Therefore, this study should not be relied upon. According to Shaoul (2009), studies by the global consulting firms Price Waterhouse Coopers and KPMG may also be biased towards PPPs because the firms have a vested interest in the projects.

Figure 1 - PPP and public debt

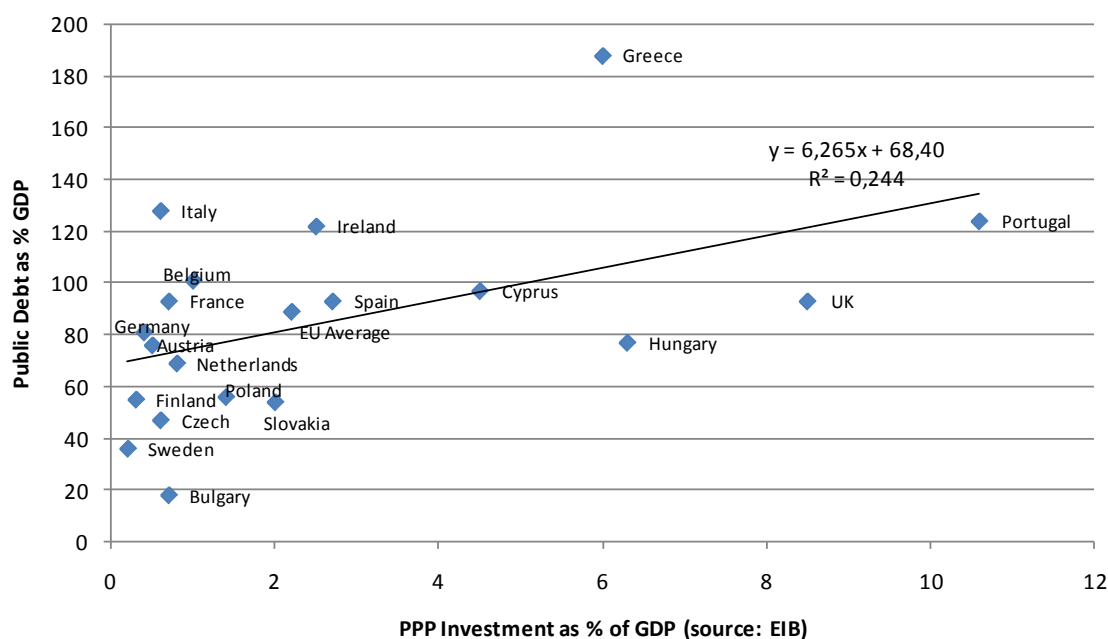


Table 1 – Allocation of different types of risk

This table summarises the literature on how risks are allocated. Planning risks: risks related with the conceptualisation and implementation of the project; Environmental risks: risks related to environmental regulations and approvals; Demand risks: risks related with insufficient demand, which is necessary to profitability; Finance risks: risks related with the financing of the CAPEX and which mainly changes with the interest rate.

Type of Risks	Literature favouring risk allocation to the Public Sector	Literature favouring shared risk allocation	Literature favouring risk allocation to the Private Sector
Planning	(Bing, Akintoye, Edwards, & Hardcastle, 2005b)	(Ng & Loosemore, 2007)	(Lam, Wang, Lee, & Tsang, 2007)
Environmental	(Lewis, 2001)	(Bing et al., 2005b)	(Ng & Loosemore, 2007) (Lam et al., 2007)
Demand	-----	(Arndt, 1999)	(Wang, Tiong, Ting, & Ashley, 2000) (Lewis, 2001) (Bing et al., 2005b) (Grimsey & Lewis, 2005b) (Ng & Loosemore, 2007) (Chung et al., 2010)
Finance	-----	(Wang et al., 2000) (Lewis, 2001) (Ng & Loosemore, 2007)	(Bing et al., 2005b) (Chung et al., 2010) (Grimsey & Lewis, 2005b)

Source: own table

Table 2 – Risk allocation in governmental reports

This table presents the main guidelines that governments (of Australia, Canada, New Zealand, and United Kingdom) use to allocate risks in PPP. PSC and VfM stand for public sector comparator and Value for Money, respectively.

Report	Country	Year	Main guidelines
(Scotia, 1997) Transferring Risks in PPP	Canada	1997	<ul style="list-style-type: none"> • Risk is divided in four categories: Ownership; Operational; Financial and “Acts of God” • Guidelines about strategies to allocate risks (must be objective and clearly evaluated)
(NAO) - Examining the value for money of deals under the Private Finance Initiative	UK	2000	<ul style="list-style-type: none"> • Description of several risk categories and to whom they should be allocated • Each project has its own specification
(Treasury) The Government’s Approach	UK	2000	<ul style="list-style-type: none"> • Clear differentiation between private sector responsibilities and remaining public sector accountability • Contractor is only exposed to financial penalties for his own performance
(Victoria) Partnerships Victoria: Guidance material Overview	Australia	2001	<ul style="list-style-type: none"> • Private party should bear risks related to designing, building, and operating the infrastructure, including the risk of obsolescence and/or residual value • VfM: government should retain the risks which they can manage efficiently • Specific government-preferred approaches for each type of risk (10 major categories) • How to price risks
(Canada) Public-Private Partnerships: A Canadian Guide	Canada	2001	<ul style="list-style-type: none"> • Potential risks associated with PPPs • Governments can reduce or eliminate these risks through negotiations and contractual arrangements • The costs that these risks represent must be factored into the PSC model • It is important to consider the financial strength of the parties to whom risks are allocated
(Victoria) Partnerships Victoria: PSC Supplementary Technical Note	Australia	2003	<ul style="list-style-type: none"> • Risk allocation guide • PSC includes a valuation of transferable and retained risks
(Canada) The Public Sector Comparator: A Canadian Best Practices Guide	Canada	2003	<ul style="list-style-type: none"> • PSC is a risk-adjusted costing • Each type of risk should be aggregated to determine the NPV of the transferable risk component of the PSC • Each type of risk should be included as a separate cash flow item, for a detailed analysis and their sensitivity
(Canada) P3 Public Sector Readiness Assessment Guide	Canada	2003	<ul style="list-style-type: none"> • Public sector must develop a contingency plans for mitigating risk • All risks should be identified in an appropriate matrix • Optimum allocation should be identified
(Treasury) PFI – Meeting the Investment Challenge	UK	2003	<ul style="list-style-type: none"> • Transfer only those risks which the private sector can more effectively and efficiently manage
(Treasury) The Orange Book	UK	2004	<ul style="list-style-type: none"> • Aims at an optimum response to risk • Prioritizes risks based on an evaluation • Establishes a principle of risk management, and the “Risk Management Assessment Framework”

Report	Country	Year	Main guidelines
(Treasury) and (Treasury) Quantitative Assessment User Guide	UK	2004 and 2007	<ul style="list-style-type: none"> • Standard mandatory spread sheet for the VfM assessment, with a proposed testable risk management approach • Identifies all relevant risks, irrespective of which party has responsibility for managing the risk • Identifies which party is best placed to manage each risk
(Treasury) PFI: strengthening long-term partnerships	UK	2006	<ul style="list-style-type: none"> • Setting out further improvements to PPP to support their ongoing important role in delivering better public services • Defines risks to be transferred to private and to be retained by public sector
(Treasury) VfM Assessment Guide	UK	2006	<ul style="list-style-type: none"> • Optimum allocation of risks is one of the main key drivers for VfM • The transfer of risks goal is to incentive private sector efficiency and VfM
(Treasury) How to manage the delivery of long-term PFI contracts	New Zealand	2007	<ul style="list-style-type: none"> • Contingent plans for the public sector in case of reassuming risks previously allocated to the private sector
(Treasury) Standardization of PFI Contracts Version 4	UK	2007	<ul style="list-style-type: none"> • Promotes a common understanding of the main risks encountered in a standard PPP project
(4P's, 2007) A guide to contract management for PFI and PPP projects	UK	2007	<ul style="list-style-type: none"> • Risks and levels of deductions must be clearly understood by all parties • Systems and methodologies should be in place to mitigate operational risks • Risks should be reviewed at all stages of the process
(Treasury) Guidance for Public Private Partnerships in New Zealand	New Zealand	2009	<ul style="list-style-type: none"> • Government has to evaluate benefits, risks, and costs of the preferred option against other options • PSC includes an estimation for any additional costs and for risks that would be transferred to the private sector partner under a PPP • Risk allocation matrix must be developed, all risks should be considered, and no unintended effects should arise
(4P's, 2009) 4P's: developing public private partnerships in housing	UK	2009	<ul style="list-style-type: none"> • Summary analysis of risks and benefits of PPP, particularly in the housing sector programme

Source: own table

Table 3 - Risk models valuation

This table presents the risk valuation models used in PPP in the literature. DEA: Data envelopment analysis; DCF: Discounted cash-flows; WACC: Weighted average cost of capital.

MODEL	AUTHORS	CHARACTERISTICS	ADVANTAGES	DISADVANTAGES	MAIN CONCLUSIONS
Value at Risk	(Gatti et al., 2007) (Li, 2008) (Hanli, ChaoQun, Bo, & Tao, 2009)	Specific VaR (with Monte-Carlo simulation) for project finance specifications	<ul style="list-style-type: none"> Calculates the default risk of a PPP project Recognises different levels of complexity of project More precise in risk-adjusted pricing 	<ul style="list-style-type: none"> Quantity and quality data required Need to checking the model structure and the key indicators Difficult to precisely estimate the distribution of parameters in the model precisely 	<ul style="list-style-type: none"> Suited for estimating project risks for sponsors and lenders Method that simplify PPP complexity
NPV at Risk	(Sudong & Tiong, 2000) (Ye S D, 2000)	Combines WACC with dual risk methods	<ul style="list-style-type: none"> Leads to a better decision in risk valuation than traditional methods like CAPM 	<ul style="list-style-type: none"> Complex Quantity and quality data required 	<ul style="list-style-type: none"> NPV at risk represents a more vigorous investment decision method
Cash-Flow at Risk	(Youngen, Guth, Tennican e Usher, (2001))	Simulates cash-flow risk by Monte-Carlo simulation	<ul style="list-style-type: none"> More appropriate for projects than VaR 	<ul style="list-style-type: none"> Requires calculating a probability distribution for future cash-flows 	<ul style="list-style-type: none"> Quantifies differences in the cash-flows related to the project risks
Credit scoring model	(Cheng, Chiang, & Tang, 2007)	calculate the credit scoring model of a PPP by DEA	<ul style="list-style-type: none"> DEA is more objective Used in several types of financial loans, not just PPP 	<ul style="list-style-type: none"> Only applies to credit scoring. Valid only for financial risk 	<ul style="list-style-type: none"> Appropriate because PPP relies strongly on debt financed by banks
Real Options	(Cheah & Jicai, 2006) (Alonso-Conde et al., 2007) (Takashima et al., 2010)	Subsidies and guarantees represent a form of options and all options have value Real options provide a framework for valuating these guarantees	<ul style="list-style-type: none"> Flexibility of this approach More accurate valuation of guarantees and risks in a PPP 	<ul style="list-style-type: none"> Use of DCF with a single risk-adjusted discount rate is problematic No multiple PPP cases in a single study Complexity of the analysis. 	<ul style="list-style-type: none"> Options can be evaluated with a Monte-Carlo simulation for a DCF model

Source: own table

Table 4 - Valuation risk models used by governments

This table shows the different valuation models used by governments to value risks in PPP.

VALUATION MODEL	COUNTRY	OFFICIAL DOCUMENT	CHARACTERISTICS	ADVANTAGES	DISADVANTAGES	MAIN CONCLUSIONS
CAPM using DCF analysis	Australia	(Victoria, 2003b)	Risk is considered in the discount rate	Simple risk valuation	Discount rate must be calculated for each project	Depends on the accuracy of forecast of cash-flows and estimation of discount rates
Risk premium with Monte-Carlo simulation	UK	(Treasury, 2003a)	Adds a risk premium to provide the value of base case, in order to adjust for the "optimist bias".	More complex and detailed analysis than other governments guidelines	Requires more data and more specialized staff	Add a risk premium to provide the full expected value of the base case is a good practice
Risk modeling with Monte-Carlo simulation	Australia	(Victoria, 2003a)	Uses probability distribution of input variables	Risk allocation guide.	Only possible if sufficient data are available	Technique depends on significance of the project and complexity of the risks
Black-Scholes Option Pricing Model	South Korea	(ADB, 2011)	<p>Examines the level of returns to private parties in comparison with the risks that they bear</p> <p>Minimum Revenue Guarantee is a private sector put option on toll revenue, and early termination is a put option on the project</p> <p>Government's redemption right is a call option on toll revenue and early termination is a call option on the project</p>	<p>Value risks for all PPP participants</p> <p>More complex and detailed analysis than other governments guidelines</p>	<p>Complex analysis</p> <p>Data requirements</p>	<p>Estimation of appropriate return has steps:</p> <p>(i) estimation of base case fair return and</p> <p>(ii) adjustment for option values such as minimum revenue guarantee or redemption right of government.</p>

Source: own table

Table 5 - Academic studies on Value for Money and Risk in PPPs

This table summarizes the academic findings regarding VfM and Risk in PPP projects. Column “VfM” indicates whether the PPP yields VfM: Y indicates that VfM is positive; N indicates that VfM is negative; N/D indicates that it could not be determined whether VfM is positive. The column ‘Risk crucial to VfM?’ shows whether risk as an indispensable issue for ensuring VfM in PPPs (Y=yes, N=no). CSF = Critical success factors; PSC= Public sector comparator; VfM= Value for Money.

AUTHOR	YEAR	COUNTRY	Type of PPP	VfM	RISK CRUCIAL TO VfM?	CONCLUSIONS
(Ball)	2000	UK	High School projects	N	Y	<ul style="list-style-type: none"> VfM remains uncertain Risk valuation has uncertainties, making risk transfer unreliable Risk transfer may not be as significant as the public sector claims
(Froud & Shaoul)	2001	UK	NHS Hospitals	N	Y	<ul style="list-style-type: none"> Risk transfer is main justification for PPP and is central to VfM Interest rate paid by private sector suggests that banks consider PPPs low risk Limited evidence on risk transfer
(McCabe)	2001	UK	Schools	N	Y	<ul style="list-style-type: none"> Concerns about quantification of risk transfer and cost calculation, which questions validation of PSC and VfM Doubts over selectivity in transferred risks, methods used to calculate risk-related costs, and the fact that the public sector assumes all demand risks Confirms questions raised by previous studies over robustness and subjective nature of evidence used to substantiate VfM in PPPs
(Pollock)	2002	UK	6 Hospitals	N	Y	<ul style="list-style-type: none"> VfM assessment is skewed in favour of private sector VfM is only shown after risk transfer NPV of PSC is lower than PPP before risk transfer No method for valuating risks
(Pollitt)	2002	UK	10 PPP projects	Y	Y	<ul style="list-style-type: none"> PPP is successful in the UK, compared with traditional procurement PPPs save time and money, promote innovation and efficiently allocate risks
(Shaoul)	2002	UK	PPP London Underground	N	Y	<ul style="list-style-type: none"> Project was not affordable, since private sector does not assume risks, relying on public guarantees
(English)	2003	Australia	Overall projects	N	Y	<ul style="list-style-type: none"> Evidence that governments are not as successful as private-sector in identifying and shifting risk and, therefore, at achieving VfM
(Edwards)	2004	UK	8 Roads and 13 hospitals	N/D	Y	<ul style="list-style-type: none"> Allocation of risk among partners may be unclear and therefore so is its transfer Additional monitoring costs have increased public sector’s costs and thus reduced VfM compared with original expectations

AUTHOR	YEAR	COUNTRY	Type of PPP	VfM	RISK CRUCIAL TO VfM?	CONCLUSIONS
(Fitzgerald)	2004	Australia	8 projects	N/D	Y	<ul style="list-style-type: none"> • Risk evaluation process needs to be improved • Need more evidence of frequency and a large sample of risks events • Public sector should use a discount rate that does not incorporate a premium risk
(Hodge)	2004	Australia	Roads infrastructure	N/D	Y	<ul style="list-style-type: none"> • Investigates risk transfer • Outlines empirical experience on transfer of risks
(Bing et al.)	2005	UK	Construction projects	N/D	Y	<ul style="list-style-type: none"> • Examines, through a questionnaire, the importance of 18 CSFs for PPP • Finds risk allocation and sharing are relevant CSFs
(Hodge)	2005	Australia	Overall projects	N/D	Y	<ul style="list-style-type: none"> • Few available assessments suggest varied performance • No rigorous and transparent evaluations of all Australian PPPs
(Pollitt)	2005	UK	Overall projects	Y	Y	<ul style="list-style-type: none"> • Positive overall assessment
(Shaoul)	2005	UK	Health sector	N	Y	<ul style="list-style-type: none"> • Risk transfer is an ambiguous concept • Uses ex-ante risk transfer to close gap between public and private options, to ensure preference is given to PPP • Instead of demonstrating risk transfer, business case simply asserts what they intended to prove
(Pollock)	2005	UK	5 government commissioned studies	N	Y	<ul style="list-style-type: none"> • Up to 24% of PPPs have 'optimism bias' in risk adjustment • Studies fail to present sound data-based proof for addressing time and costs overruns
(Dixon)	2005	UK	Case-studies	N/D	Y	<ul style="list-style-type: none"> • VfM and risk transfer are key to success • High procurement and transaction costs, and large-scale nature of PPPs are barriers to entry
(Boardman)	2005	USA	Private toll road case	N	Y	<ul style="list-style-type: none"> • PPPs incur significant losses, even after refinancing and tax benefits
(Shaoul, Stafford, & Stapleton)	2006	UK	8 Highway projects	N	Y	<ul style="list-style-type: none"> • Risk transfer is critical to PPP VfM • Most risk transfers are related to construction risks. But after construction phase, it is not clear what other risks, beside operational ones, the private sector accounts for • Risk transfer is very expensive
(Blanc-Brude)	2006	Europe	65 PPP across 15 EU countries	N/D	Y	<ul style="list-style-type: none"> • Ex-ante construction costs of PPPs are 24% higher than traditional procurement • Whether PPPs have lower overall life-cycle costs remains unknown

AUTHOR	YEAR	COUNTRY	Type of PPP	VfM	RISK CRUCIAL TO VfM?	CONCLUSIONS
(Darvish)	2006	Australia	2 PPP: Tunnel and Airport	N	Y	<ul style="list-style-type: none"> VfM and private sector profits in PPPs are only viable through optimal risk allocation and balance of interests between public and private sectors
(English)	2007	Australia	Overall projects	N	Y	<ul style="list-style-type: none"> Australia's audit offices largely fail to independently scrutinise PPP High premium in transferring risks to private sector
(Pollock, Price, & Player)	2007	UK	11 PPP projects	N	Y	<ul style="list-style-type: none"> No evidence of improved efficiency in PPP The Treasury "Green book" is biased towards PPPs
(Ng & Loosemore)	2007	Australia	Railway project	N	Y	<ul style="list-style-type: none"> Government assumes most of the risks. Provides useful recommendations for better risk management Shows complexity and obscurity of risks in PPPs and difficulties in distributing such risks appropriately
(Chung)	2007	Australia	Hospital project	N	Y	<ul style="list-style-type: none"> Government fails to ensure that financing is channelled through appropriate risk sharing arrangements. It fails to make private sector accountable for required level of quality
(Ball)	2007	UK	School projects	N	Y	<ul style="list-style-type: none"> Suggests a significant problem with VfM in PPP projects VfM and economic viability of projects depend entirely on transfer of risk in 9 of 11 projects Highlights problems with risk transfer 2/3 of risk transfer regards construction and quality. Inaccurate risk transfer lead to different results in VfM Without risk transfer, 5 projects would have had a lower VfM by more than 10%
(Nisar)	2007	UK	5 cases: Prison, hospital, bridge and military	N	Y	<ul style="list-style-type: none"> Evidence is balanced on PPP effectiveness More emphasis needs to be placed on strategies for transfer of risk for successful conclusion of PPP contracts
(Chan)	2008	Australia	Bridge project	N	Y	<ul style="list-style-type: none"> Improper allocation of risks could affect success of PPP Project failed due to fact that Government managed to pass on many of the project risks to private sector
(Barlow & Köberle-Gaiser)	2008	UK	6 hospitals	N	Y	<ul style="list-style-type: none"> PPPs increase complexity between project delivery and hospital operational functions Inefficient allocation of risks hinders innovation PPPs do not automatically lead to efficiency and innovation benefits

AUTHOR	YEAR	COUNTRY	Type of PPP	VfM	RISK CRUCIAL TO VfM?	CONCLUSIONS
(Broadbent et al.)	2008	UK	17 Health PPPs	N	Y	<ul style="list-style-type: none"> • Risk estimation is central in decision making • Dominance in “accounting logic” • Quantitative analysis and recognising uncertainty are important
(Andrew)	2009	Australia	Prisons	N	Y	<ul style="list-style-type: none"> • Cost data are not an adequate basis for policy decisions
(Tallman)	2010	Canada	Overall projects	N	Y	<ul style="list-style-type: none"> • In over half of the cases, risks are identified through formal mechanisms, but few quantify risks • Less than half of the cases show VfM generation. Half of the cases do not evaluate VfM.
(Cuthbert & Cuthbert)	2010	UK	Health project	N	Y	<ul style="list-style-type: none"> • NPV of PSC is inflated because of misallocation ascribing of risks and costs. • Decision was biased in PPP favour
(Demirag & Khadaroo)	2010	UK	School projects	Y	Y	<ul style="list-style-type: none"> • Evaluates VfM Ex-post and impact of project size in VfM • Teachers are satisfied with the outcomes overall, more so in small projects
(Demirag, Khadaroo, Stapleton, & Stevenson)	2010	UK and Scotland	Overall projects with 6 case-studies	N/D	Y	<ul style="list-style-type: none"> • Risks transferred from public sector are dispersed amongst multiple entities. This dispersion of risks adds cost, raising questions about VfM
(Sarmiento)	2010	Portugal	PPP roads	N	Y	<ul style="list-style-type: none"> • PSC considerably below PPP payments • PPPs only show VfM if public sector has high levels of inefficiency
(Ball)	2011	Australia and UK	Overall projects	ND	Y	<ul style="list-style-type: none"> • In the UK there are doubts about the validity of the VfM analysis, even the NAO ones. • In Australia some analysis conclude that some projects did not show VfM • In most cases is the risk transfer element that provides the PPP with VfM
(Maqsood, Khalfan, & Aranda-Mena)	2012	Australia	Overall projects	Y	Y	<ul style="list-style-type: none"> • PPPs show VfM especially in large and complex projects, due to risk transfer
(Haughton & Mcmanus)	2012	Australia	Tunnel project	N	Y	<ul style="list-style-type: none"> • This project failed to deliver most of its objectives.
(Barlow, Roehrich, & Wright)	2013	Europe	Health	N/D	Y	<ul style="list-style-type: none"> • Results are mixed: older PPPs did not show effectiveness, as new models show better opportunities for gains, but are harder to set up and manage

Source: own table

Table 6 - Main criticism on VfM in PPP

This table summarizes the main criticisms in the literature regarding VfM in PPPs.

PSC: Public sector comparator; VfM: Value for Money

Main Points	Main ideas	Authors
Private sector risks	<ul style="list-style-type: none"> Private sector assumes few risks and therefore has little incentive to perform better and be more efficient 	(Ball, 2000);(Froud & Shaoul, 2001); (Shaoul, 2002); (Shaoul et al., 2006); (Ng & Loosemore, 2007)
Risk concepts	<ul style="list-style-type: none"> Risk is an ambiguous concept Risk is complex Risk valuation is uncertain 	(Ball, 2000); (Shaoul, 2005); (Ng & Loosemore, 2007); (Broadbent et al., 2008)
Risk valuation	<ul style="list-style-type: none"> No methods or simple methods used 	(McCabe, 2001); (Pollock, 2002); (Fitzgerald, 2004); (Tallman, 2010)
PSC	<ul style="list-style-type: none"> PSC is biased in favour of PPP Optimist bias Discount rate used in PSC favours PPPs 	(Pollock, 2002);(Pollock, 2005);(Pollock et al., 2007);(Shaoul, 2005); (Sarmiento, 2010)
Risks and VfM	<ul style="list-style-type: none"> Risk transfer is used to close the gap between PSC and PPP PPP only show VfM after risk transfer 	(Froud & Shaoul, 2001); (Pollock, 2002); (Shaoul, 2005); (Ball, 2007)

Source: own table

Table 7 - Public sector reports on Value of Money and Risk in PPPs

Panel A summarizes government reports on PPP whereas Panel B shows Courts of Audit reports. Both panels evaluate PPPs' VfM and the role of risk in achieving VfM. Column VfM indicates whether Value for Money is obtained (Y=yes, N= No; N/D=unable to determine VfM. Column "Risk crucial to VfM?" shows if the study considers risk as an indispensable issue for ensuring VfM in PPPs. CSF= Critical success factors; PSC= Public sector comparator; VfM= Value for Money

PANEL A – GOVERNMENT REPORTS

AUTHOR	YEAR	COUNTRY	PPP ANALYZED	VfM	RISK CRUCIAL TO VfM?	CONCLUSIONS
(Andersen)	2000	UK	29 projects	Y	Y	<ul style="list-style-type: none"> Risk is the main driver (out of 6) of VfM Cost savings amount to 17% relative to traditional procurement, but most of these savings are explained by 2 very successful PPPs
(Macdonald)	2002	UK	11 PPP vs 39 public projects	Y	Y	<ul style="list-style-type: none"> PPPs deliver late in 24% of cases and overestimated cost in 22% Public projects deliver late in 70% of cases and overestimated cost in 73%
(Commission)	2003	UK	Schools	Y	Y	<ul style="list-style-type: none"> Economic viability and VfM in all PPP schools depend on risk transfer
((VPAEC))	2006	Australia	Overall projects	N/D	Y	<ul style="list-style-type: none"> Limited independent external scrutiny of PPP to date Inadequate independent oversight (in quality and quantity); Inconclusive on PPPs ability to transfer risk, achieve VfM and savings, and other program objectives
(Group)	2007	Australia	21 PPP projects vs 33 public	Y	Y	<ul style="list-style-type: none"> PPPs clearly demonstrate greater cost efficiency than traditional procurement Traditional procurement does not eliminate risks, only transfers them to taxpayers
(Forum)	2008	Australia	PPP projects vs traditional procurement	Y	y	<ul style="list-style-type: none"> In 35% of the cases, PPPs perform better than traditional procurement PPPs have average cost escalation of 4.3%, compared to 18% for traditional projects During construction, average delay for PPPs is 2.6%, and for traditional procurement 25.9%
(CCPPP)	2010	UK	Schools	Y	Y	<ul style="list-style-type: none"> Appropriate risk allocation assists efficient operation

PANEL B – COURT^s OF AUDIT REPORTS

AUTHOR	YEAR	COUNTRY	PPP ANALYZED	VfM	RISK CRUCIAL TO VfM?	CONCLUSIONS
(NAO)	2003	UK	38 PPPs vs 37 public projects	Y	Y	<ul style="list-style-type: none"> • PPP deliver on time in 76% of cases and within budget in 78% • Public projects deliver on time in only 30% of cases and within budget in only 27%
(NAO)	2004	UK	London underground	N/D	Y	<ul style="list-style-type: none"> • Inconclusive on performance assessment against contractual benchmarks • Public sector needs to follow best practices in risk management
(NAO)	2004	UK	London underground	N/D	Y	<ul style="list-style-type: none"> • Limited assurance that risk valuation is credible • High rate of return for the risks assumed
(NAO)	2006	UK	Paddington Hospital	N	Y	<ul style="list-style-type: none"> • Large number and scale of risks is one of three main reasons for project's failure • Significant risks, due to complexity and timescale (that lead to specific additional project and political risks)
(AUDIT)	2006	Australia	Schools	Y	Y	<ul style="list-style-type: none"> • VfM is achieved with risk transfer • Savings between PPP and PSC are due to valuation of risk transfer to private sector
(AUDIT)	2006	Australia	Tunnel project	N/D	Y	<ul style="list-style-type: none"> • Inconclusive on whether PPP generates VfM
(Auditor-General)	2007	Australia	2 major PPP projects	Y	Y	<ul style="list-style-type: none"> • Risk allocation is reasonable • Projects are well managed and effective
(NAO)	2009	UK	Defence PPP projects	Y	Y	<ul style="list-style-type: none"> • Effective risk allocation and management is particularly important to delivering VfM in PPP contracts • Most risks are well managed • In nine out of ten examined risk categories, there was either low or moderate risk in private sector • Six of eight case studies show VfM

AUTHOR	YEAR	COUNTRY	PPP ANALYZED	VfM	RISK CRUCIAL TO VfM?	CONCLUSIONS
(NAO)	2009	UK	Overall PPP	Y	Y	<ul style="list-style-type: none"> • PPPs usually deliver what was contracted. They also successfully transfer risks • Risk transfer depends on contracts • Few PPPs fail
(NAO)	2009	UK	Construction performance	Y	Y	<ul style="list-style-type: none"> • PPPs were delivered on time and within budget in two thirds of the time • Public projects were delivered on time in two thirds of the cases and within budget in half of the cases
(NAO)	2009	UK	Schools	N/D	Y	<ul style="list-style-type: none"> • Inconclusive regarding VfM • Achieving VfM requires cost savings in long-run
(NAO)	2009	UK	Municipal waste	N/D	Y	<ul style="list-style-type: none"> • VfM depend if PPP meet the expected targets
(NAO)	2010	UK	Overall PPP: 162 projects	N	Y	<ul style="list-style-type: none"> • No clear data to conclude whether PPPs have led to demonstrably better or worse VfM than other forms of procurement • Insufficient data on returns to equity investors for the risks they bear • Due to financial crisis, PPPs may no longer be as efficient as they were in the past
(NAO)	2010	UK	Housing sector	N/D	Y	<ul style="list-style-type: none"> • Housing is one of the more complex PPP sectors due to the specific risks (construction and tenants) • More comparative assessment of VfM and risks is necessary
(NAO)	2010	UK	Hospital	Y	Y	<ul style="list-style-type: none"> • Most contracts perform satisfactorily or better than expected • Inconclusive about whether PPPs generate VfM better by including hotel services in contracts
(Auditor-General)	2010	Australia	Prisons	N	Y	<ul style="list-style-type: none"> • Appropriate management of the allocated risks is necessary to avoid deterioration in the VfM
(NAO)	2012	UK	Equity capital in PPP	N/D	Y	<ul style="list-style-type: none"> • Private investors bear some but very limited risks. • Public sector has relied on competition to seek efficient contract pricing, without information about the PSC cost • Concern that public sector is paying more than it should for equity investment

Source: own table

Table 8 –PPP in government’s reports

This table summarizes the main arguments for and against PPPs, according to the government and courts of audit reports included in Table 5 and 7.

VfM: Value for Money

Arguments in favour	Arguments against
PPPs reduce cost and time deviations	VfM depends entirely on risk transfer Yet, risk transfer is subjective and difficult to measure
PPPs deliver what was contracted	Low/inadequate risk transfer
Few PPPs fail and most perform well	Public sector could be paying more than it should
With time and experience, PPPs become more efficient, and private sector returns decrease (in early PPPs, the private sector gained excessive returns)	Not all projects should be conducted as a PPP
Traditional procurement does not eliminate risks, but only transfer them to taxpayers	Evaluations are not independent enough
	More and better studies and evaluations are required
	Insufficient data

Source: own table

Table 9 - Value for Money in PPPs

This table presents the results on VfM from academic studies, government reports and Courts of Audit reports. Information is presented by the number of studies/reports by evaluation outcome (Y – show VfM; N – Not show VfM, N/D- VfM not determined). Source: own table

Academic Studies				
Country	Nº Studies	VfM?		
		YES	NO	N/D
UK	22 (55%)	3 (7.5%)	14 (35%)	5 (12.5%)
Australia	13 (32.5%)	1 (2.5%)	8 (20%)	4 (10%)
Canada	1 (2.5%)	0	1 (2.5%)	0
Europe	2 (5%)	0	0	2 (5%)
Portugal	1 (2.5%)	0	1 (2.5%)	0
USA	1 (2.5%)	0	1 (2.5%)	0
TOTAL	40	4 (10%)	25 (62.5%)	11 (27.5%)
Government reports				
Country	Nº Studies	VfM?		
		YES	NO	N/D
UK	4 (40%)	4 (40%)	0	0
Australia	3 (30%)	2 (20%)	0	1 (20%)
TOTAL	7	6 (86%)	0	1 (14%)
Courts of Audit reports				
Country	Nº Studies	VfM?		
		YES	NO	N/D – N/A
UK	13 (76%)	5 (29%)	2 (12%)	6 (35%)
Australia	4 (24%)	2 (12%)	1 (6%)	1 (6%)
TOTAL	17	7 (41%)	3 (18%)	7 (41%)

Table 10 –The UK and Australian PPP experience

This table shows an overview of PPP studies by country and type of projects and highlights the studies which demonstrate that VfM was generated and those which cannot. The table limits to studies to those on the UK and Australia. BC: Business Case; NAO: National Audit Office (UK); PSC: Public Sector Comparator.

Panel A: Comparable studies on VfM by country and type of project			
COUNTRY	PPP PROJECT	STUDIES THAT SHOW VfM	STUDIES THAT DID NOT SHOW VfM
Australia	Overall projects	(Group, 2007) (Forum, 2008)	(English, 2003) (English, 2007)
	Prisons	(Auditor-General, 2010)	(Andrew, 2009)
	Railway	-----	(Ng & Loosemore, 2007)
	Schools	(AUDIT, 2006b)	-----
	Health	-----	(Chung, 2007)
	Individual projects evaluations	(Auditor-General, 2007)	(Darvish, 2006) (Chan, 2008)
UK	Overall projects	(Andersen, 2000) (Macdonald, 2002) (Pollitt, 2002) (NAO, 2003) (Pollitt, 2005) (NAO, 2009e) (NAO, 2009d)	(Shaoul, 2005) (NAO, 2010a)
	Schools	(Commission, 2003) (CCPPP, 2010) (Demirag et al., 2010)	(Ball, 2000) (McCabe, 2001) (Ball, 2007)
	Health	(NAO, 2010b)	(Froud & Shaoul, 2001) (Pollock, 2002) (NAO, 2006) (Barlow & Köberle-Gaiser, 2008) (Cuthbert & Cuthbert, 2010)
	Roads	-----	(Shaoul et al., 2006)
	Defence	(NAO, 2009a)	-----
	Individual projects evaluations	-----	(Shaoul, 2002) (Pollock, 2005) (Pollock et al., 2007) (Nisar, 2007)

Source: own table

Table 10 (continued)

Panel B : Comparable studies on VfM by country and type of methodology					
COUNTRY	PPP PROJECT	STUDY SHOW VfM		STUDY NOT SHOW VfM	
		AUTHOR	METHODOLOGY	AUTHOR	METHODOLOGY
AUSTRALIA	Overall projects	(Group, 2007)	•Compares costs and times between traditional procurement and PPPs	(English, 2003)	•Based on PPPs' performance audits
		(Forum, 2008)	•Compares capital costs between traditional procurement and PPPs	(English, 2007)	
UK	Overall projects	(Andersen, 2000)	•Calculates the cost of the PSC (with risk adjustment) and compares it with the PPP cost	(NAO, 2010a)	•Compares the conclusions of five previous NAO reports
		(Macdonald, 2002)	•Compares real costs and time execution with the base case		
		(Pollitt, 2002)	•Case-studies and overall NAO assessment		
		(NAO, 2003)	•Compares the PPPs cost with traditional procurement cost •Assumes the latter to have a certain price, be completed on time, and have the same quality output		
		(Pollitt, 2005)	•Case studies		
		(NAO, 2009e)	•Based on conclusions of previous reports of NAO		
		(NAO, 2009d)	•Survey: Do PPPs achieve contracted price, time, and quality?		
	Schools	(Commission, 2003)	•Compares PSC with PPPs	(Ball, 2000)	•Survey on risk impact
		(CCPPP, 2010)	•A survey on opinion of several stakeholders	(McCabe, 2001)	•Case-study
		(Demirag et al., 2010)	•Survey	(Ball, 2007)	•Analysis of VfM without risk transfer
	Health	(NAO, 2010b)	•Compares real costs /specifications with contract; •Compares management with best practices;	(Shaoul, 2005)	•Compare PSC with PPPs
				(Barlow & Köberle-Gaiser, 2008) (Cuthbert & Cuthbert, 2010)	•Interviews and case studies •Case-study

Source: own table

REFERENCES

- 4Ps (2007) A guide to contract management for PFI and PPP projects.
- 4Ps (2009) Developing public private partnerships in housing.
- (VPAEC), V. P. A. a. E. C. 2006. Report on Private Investment in Public Infrastructure, Seventy First Report to Parliament. In V. Parliament (Ed.). Melbourne; Australia.
- ADB, K.-. 2011. Public–Private Partnership Infrastructure Projects: Case Studies from the Republic of Korea Volume 1: Institutional arrangements and performance.
- Akintoye, A., Beck, M., and Hardcastle, C. (2003) *Public-private partnerships: managing risks and opportunities*. Oxford; Malden, MA: Blackwell Science.
- Akintoye, A. Beck, M., Hardcastle, C., Chinyio, E., and Asenova, D. (2001) *Risks in private finance initiative projects*. Paper presented at the Public and Private Sector Partnerships: The Enterprise Governance, Sheffield, UK.
- Alonso-Conde, A.B., Brown, C., and Rojo-Suarez, J. (2007) Public private partnerships: incentives, risk transfer, and real options. *Review of Financial Economics* 16(4): 335-349.
- Andersen, A. 2000. “Value for Money Drivers in the Private Finance Initiative”, *Arthur Andersen and Enterprise LSE, London*.
- Andrew, J. L. C. D. (2009) Value for money? Neo-liberalism in New South Wales prisons. *Australian Accounting Review* 19(2): 144-152.
- Araújo, S. (2010) Public-private partnerships and investment in infrastructure. In OECD Economics Department Working Papers (Ed.): OECD Publishing.
- Arndt, R. (1999) Optimum risk transfer in build-own-operate-transfer projects: the challenge for governments. *Transactions of Multi-Disciplinary Engineering* 22.
- Arrow, K.J., and Lind, R.C. (1970) Uncertainty and the evaluation of public investment decisions. *The American Economic Review* 60(3): 364-378.
- Arthur Andersen & Company (2000) Value for money drivers in the private finance initiative. *Arthur Andersen and Enterprise LSE, London*.
- Asenova, D., and Beck, M. (2010) Crucial silences: when accountability met PFI and finance capital. *Critical Perspectives on Accounting* 21(1): 1-13.
- Asian Development Bank (2011) Public–private partnership infrastructure projects: Case studies from the Republic of Korea Volume 1: Institutional arrangements and performance.
- Audit Commission (2003) PFI in Schools, *London: Audit Commission*.
- Auditor-General New South Wales (2006a) The Cross City Tunnel project.
- Auditor-General New South Wales (2006b) The new schools privately financed project.
- Ball, R. (2011) Provision of public service infrastructure—the use of PPPs in the UK and Australia: a comparative study. *International Journal of Public Sector Management* 24(1): 5-22.
- Ball, R., Heafey, M., and King, D. (2007) The private finance initiative in the UK. *Public Management Review* 9(2): 289-310.
- Ball, R., Heafey, M., and King, D. (2000) Private finance initiative - a good deal for the public purse or a drain on future generations? *Policy & Politics* 29(1): 95-108.
- Barlow, J. and Köberle-Gaiser, M. (2008) The private finance initiative, project form and design innovation: The UK's hospitals programme. *Research Policy* 37(8): 1392-1402.
- Barlow, J., Roehrich, J., and Wright, S. (2013) Europe sees mixed results from public-private partnerships for building and managing health care facilities and services. *Health Affairs* 32(1): 146-154.
- Bing, L., Akintoye, A., Edwards, P.J., and Hardcastle, C. (2005a) The allocation of risk in PPP/PFI construction projects in the UK. *International Journal of Project Management* 23(1): 25-35.
- Bing, L., Akintoye, A., Edwards, P.J., and Hardcastle, C. (2005b) Critical success factors for PPP/PFI projects in the UK construction industry. *Construction Management & Economics* 23(5): 459-471.
- Black, F., Jensen, M.C., and Scholes M. (1972) The capital asset pricing model: some empirical tests. In M. J. ed. (Ed.), *Studies in the Theory of Capital Markets*, 79–121: New York: Praeger Publishers.
- Blanc-Brude, F., Goldsmith, H., and Valila, T. (2006) Ex-ante construction costs in the European road sector: a comparison of public-private partnerships and traditional public procurement. In E. I. Bank (Eds.), *European and Financial Report*, Vol. 2006.

- Boardman, A.E., Poschmann, F., and Vining, A. (2005) North American infrastructure P3s: examples and lessons learned. In G. Hodge, and Greve, C. (Eds.), *The Challenge Of Public-Private Partnerships: Learning From International Experience*. Cheltenham, UK.: Edward Elgar Publishing.
- Boardman, A.E. and Vining, A. (2010) Assessing the economic worth of public-private partnerships. *International handbook on public private partnerships*. [____].Edward Elgar.
- Bovaird, T. (2004) Public-private partnerships: from contested concepts to prevalent practice. *International Review of Administrative Sciences* 70(2): 199-215.
- Brealey, R., Cooper, I., and Habib, M. (1997) Investment appraisal in the public sector. *Oxford Review of Economic Policy* 13(4): 12-28.
- Broadbent, J., Gill, J., and Laughlin, R. (2008). Identifying and controlling risk: the problem of uncertainty in the private finance initiative in the UK's National Health Service. *Critical Perspectives on Accounting* 19(1): 40-78.
- Broadbent, J., and Laughlin, R. (2003) Control and legitimization in government accountability processes: the private finance initiative in the UK. *Critical Perspectives on Accounting* 14(1-2): 23-48.
- Canada, I. (2001) Public-private partnerships: a Canadian guide.
- Canada, I. (2003a) P3 public sector readiness assessment guide.
- Canada, I. (2003b) The public sector comparator: a Canadian best practices guide.
- CCPPP (2010) International PPP School Survey Report.
- Chan, A.L., Lam, P.T.I., Chan, D.W.M., and Cheung, E. (2008) Risk-sharing mechanism for PPP Projects – the case study of the Sydney Cross City Tunnel. *Surveying and Built Environment* 19(1): 67-80.
- Cheah, C.Y.J., and Liu, J. (2006). Valuing governmental support in infrastructure projects as real options using Monte Carlo simulation. *Construction Management & Economics* 24(5): 545-554.
- Cheng, E.W.L., Chiang, Y.H., and Tang, B. S. (2007) Alternative approach to credit scoring by DEA: evaluating borrowers with respect to PFI projects. *Building and Environment* 42(4): 1752-1760.
- Chung, D. (2007) *Public private partnerships: an early experience in Australia*. Paper presented at the Intellectbase International Consortium (IIC) Conference Committee, Atlanta.
- Chung, D., Hensher, D. A., and Rose, J. M. (2010) Toward the betterment of risk allocation: investigating risk perceptions of Australian stakeholder groups to public-private-partnership tollroad projects. *Research in Transportation Economics* 30(1): 43-58.
- Corner, D. (2006) The United Kingdom Private Financing Initiative: the challenges of allocating risk. *OECD Journal on Budgeting* 5(3): 37-55.
- Cuthbert, M., and Cuthbert, J. (2010) The Royal Infirmary of Edinburgh: a case study on the workings of the Private Finance Initiative. *Public Money & Management* 30(6): 371-378.
- Darvish, H. Z., Patrick; Loosemore, M., and Zhang, G. (2006). Risk Management, public interests and value for money in PPP projects: Literature review and case studies, *CRIOCM International Symposium on Advancement of Construction Management and Real Estate*.
- Debande, O. (2002) Private financing of transport infrastructure. An assessment of the UK experience. *Journal of Transport Economics and Policy* 36(Part 3): 355-387.
- Demirag, I. and Khadaroo, I. (2008) Accountability and value for money in private finance initiative contracts. *Financial Accountability & Management* 24(4): 455-478.
- Demirag, I. and Khadaroo, I. (2009) Costs, outputs and outcomes in school PFI contracts and the significance of project size. *Public Money & Management* 30(1): 13-18.
- Demirag, I. Khadaroo, I., Stapleton, P., and Stevenson, C. (2010) *Public private partnership financiers' perceptions of risks*. Edinburgh: The Institute of Chartered Accountants of Scotland.
- Dixon, T., Pottinger, G., and Jordan, A. (2005) Lessons from the private finance initiative in the UK: benefits, problems and critical success factors. *Journal of Property Investment & Finance* 23(5): 412-423.
- Edwards, P., Jean, S., Stafford, A., and Arblaster, L. (2004). Evaluating the operation of PFI in roads and hospitals. London: Certified Accountants Educational Trust.
- English, L. M. (2007) Performance audit of Australian public private partnerships: legitimising government policies or providing independent oversight? *Financial Accountability & Management* 23(3): 313-336.
- English, L. M., and Guthrie, J. (2003) Driving privately financed projects in Australia: what makes them tick? *Accounting, Auditing & Accountability Journal* 16(3): 493-511.
- Esty, B. (Ed.). (2004) *Modern project finance: a casebook*. John Wiley & Sons, Inc.
- European Commission (2003) Guidelines for Successful Public-Private Partnerships. In EC. D.-G. R. Policy (Ed.).

- Fitzgerald, P. (2004) Review of partnerships Victoria provided infrastructure: final report to the treasurer. *Growth Solutions Group, Melbourne, Australia.*
- Flyvbjerg, B., Holm, M.S., and Buhl, S. (2002) Underestimating costs in public works projects: error or lie? *Journal of the American Planning Association* 68(3): 279-295.
- Forrer, J., Kee, J.E., Newcomer, K.E., and Boyer, E. (2010) Public-private partnerships and the public accountability question. *Public Administration Review* 70(3): 475-484.
- Forum, N.P. (2008). Benchmarking study, Phase II. University of Melbourne.
- Fouracre, P.R., Allport, R.J., and Thomson, J.M. (1990) The performance and impact of rail mass transit in developing countries (TRRL Research Report 278). In T. a. R. R. Laboratory. (Ed.). Crowthorne, UK.
- Froud, J. (2003) The private finance initiative: risk, uncertainty and the state. *Accounting, Organizations and Society*, 28(6): 567-589.
- Froud, J., and Shaoul, J. (2001) Appraising and evaluating PFI for NHS Hospitals. *Financial Accountability & Management* 17(3): 247-270.
- Gatti, S., Rigamonti, A., Saita, F., and Senati, M. (2007) Measuring value-at-risk in project finance transactions. *European Financial Management* 13(1): 135-158.
- Glaister, S. (1999) Past abuses and future uses of private finance and public private partnerships in transports. *Public Money and Management*, July-September: 29-36.
- Glaister, S., Scanlon, R., and Travers, T. (2000) Getting public private partnerships going in transport. *Public Policy and Administration* 15(4): 50-71.
- Grimsey, D., and Lewis, M. (2005a) *The economics of public private partnerships*. Cheltenham; Northampton, MA: Edward Elgar.
- Grimsey, D., and Lewis, M.K. (2002) Evaluating the risks of public private partnerships for infrastructure projects. *International Journal of Project Management* 20(2): 107-118.
- Grimsey, D., and Lewis, M.K. (2005b) Are public private partnerships value for money? Evaluating alternative approaches and comparing academic and practitioner views. *Accounting Forum* 29(4): 345-378.
- Group, A. C. 2007. Performance of PPPs and Traditional Procurement in Australia.
- Grout, P. A. (1997) The economics of the private finance initiative. *Oxford Review of Economics Policy* 13(4): 53-66.
- Hanli, C., ChaoQun, M., Bo, L., and Tao, Q. (2009) *Studies on risk management of the urban infrastructure projects based on the PPP financing model*. Paper presented at the Automation and Logistics, 2009. ICAL 2009. IEEE International Conference.
- Houghton, G., and Mcmanus, P. (2012) Neoliberal experiments with urban infrastructure: the Cross City Tunnel, Sydney. *International Journal of Urban and Regional Research* 36(1): 90-105.
- Helliar, C., Lonie, A., Power, D., and Sinclair, D. (2001) Attitudes of UK managers to risk and uncertainty. *Balance Sheet* 9(4): 7-10.
- HM Treasury (1998) PFI technical note no.3: how to account for PFI transactions. In H. Treasury (Ed.). London.
- HM Treasury (2003a) The green book: appraisal and evaluation in central government. In H. Treasury (Ed.). London.
- HM Treasury (2003b) PFI – Meeting the Investment Challenge.
- HM Treasury (2004a) The Orange Book Management of Risk – Principles and Concepts..
- HM Treasury (2004b) Quantitative Assessment User Guide.
- HM Treasury (2006a) PFI: strengthening long-term partnerships.
- HM Treasury (2007a) Quantitative Assessment User Guide.
- HM Treasury (2007b) Standardisation of PFI Contracts Version 4.
- HM Treasury (2000) PPP: The Government's Approach In L. T. S. Office (Ed.).
- HM Treasury (2006b) VFM Assessment Guide..
- Hodge, G. A. (2004) The risky business of public-private partnerships. *Australian Journal of Public Administration* 63(4): 37-49.
- Hodge, G. A. (2005) Public-private partnerships: The Australian experience with physical infrastructure. In G. H. a. C. G. (eds.) (Ed.), *The Challenge of Public-Private Partnerships: Learning from International Experience*. Cheltenham: Edward Elgar.
- Hodge, G. A. and Greve, C. (2009) PPPs: the passage of time permits a sober reflection. *Economic Affairs* 29(1): 33-39.

- Hood, J., Fraser, I.A.N., and McGarvey, N. (2006) Transparency of risk and reward in UK public-private partnerships. *Public Budgeting & Finance* 26(4): 40-58.
- Infrastructure Partnerships Australia (2007) Performance of PPPs and Traditional Procurement in Australia.
- Javid, M. and Seneviratne, P.N. (2000) Investment risk analysis in airport parking facility development. *Journal of Construction Engineering and Management* 126(4): 298.
- Jin, X. H. (2010) Determinants of efficient risk allocation in privately financed public infrastructure projects in Australia. *Journal of Construction Engineering and Management* 136: 138
- Jorion, P. (2006). *Value at Risk: The New Benchmark for Managing Financial Risk*. McGraw-Hill, New York.
- Klijn, E. H. and Teisman, G.R. (2000) Governing public – private partnerships: analysing and managing the process and institutional characteristics of public-private partnerships. In S. P. Osborne (Ed.), *Public Private Partnerships: Theory and Practice in International Perspective*. London: Routledge.
- Kwak, Y.H., Chih, Y., and Ibbs, C. W. (2009) Towards a comprehensive understanding of public private partnerships for infrastructure development. *California Management Review* 51(2): 51-78.
- Lam, K.C., Wang, D., Lee, P.T.K., and Tsang, Y.T. (2007) Modelling risk allocation decision in construction contracts. *International Journal of Project Management* 25(5): 485-493.
- Lewis, M. (2001) Risk management in public private partnerships, *CeGe Research Workshop*. Gottingen.
- Li, B., Akintoye, A., Edwards, P. J., and Hardcastle, C. (2005) Perceptions of positive and negative factors influencing the attractiveness of PPP/PFI procurement for construction projects in the UK: findings from a questionnaire survey. *Engineering, Construction and Architectural Management* 12(2): 125-148.
- Li, X.D. (2008) Monte Carlo simulation and a value-at-risk of concessionary project. *Management Research News* 31(12): 912-921.
- Linder, S.H. (1999) Coming to terms with the public-private partnership a grammar of multiple meanings. *American Behavioral Scientist* 43(1): 35-51.
- Lintner, J. (1965) The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *The Review of Economics and Statistics* 47(1): 13-37.
- Macdonald, M. (2002) Review of large public procurement in the UK. London.
- Maqsood, T., Khalfan, M., and Aranda-Mena, G. (2012) *Do public private partnerships (PPP projects) provide value for money for infrastructure development in Australia?* Paper presented at the Joint CIB W70/92 & TG 72.
- McCabe, B., McKendrick, J., and Keenan, J. (2001) PFI in Schools - Pass or Fail? *Journal of Finance and Management in Public Services*, 1(Summer 2001): 63-74.
- McDowall, E. (2003) Applications of risk management strategies in public-private partnerships procurement. In A. B. Akintoye, M. Hardcastle, C. (Ed.), *Public Private Partnerships - Managing Risks and Opportunities*: 183-204. London: Blackwell Science.
- Medda, F. (2007) A game theory approach for the allocation of risks in transport public private partnerships. *International Journal of Project Management* 25(3): 213-218.
- Mehra, R. and Prescott, E.C. (1988) The equity risk premium: A solution? *Journal of Monetary Economics* 22(1): 133-136.
- Moreno, M. and Navas, J. (2003) On the robustness of least-squares Monte Carlo (LSM) for pricing American derivatives. *Review of Derivatives Research* 6(2): 107-128.
- National Audit Office (2000) Examining the value for money of deals under the Private Finance Initiative London: The Stationery Office.
- National Audit Office (2003) PFI: Construction performance. report by the Comptroller and Auditor General,. In N. A. Office (Ed.). London: The Stationery Office.
- National Audit Office (2004a) London Underground are the public private partnerships likely to work successfully? In T. S. Office (Ed.). London.
- National Audit Office (2004b) London Underground PPP: Were they good deals? In T. S. Office (Ed.). London.
- National Audit Office (2006) The Paddington Health Campus scheme.
- National Audit Office (2009a) Allocation and management of risk in Ministry of Defence PFI projects.
- National Audit Office (2009b) The building schools for the future programme renewing the secondary school estate. In T. S. Office (Ed.). London.
- National Audit Office (2009c) Managing the waste PFI programme. In T. S. Office (Ed.). London.
- National Audit Office (2009d) Performance of PFI construction.
- National Audit Office (2009e) Private Finance Projects. In T. S. Office (Ed.).
- National Audit Office (2010a) Lessons from PFI and other projects.

- National Audit Office (2010b) The performance and management of hospital PFI contracts.
- National Audit Office (2010c) PFI in housing. In T. S. Office (Ed.). London.
- National Audit Office (2012) Equity investment in privately financed projects. London.
- National Infrastructure Unit, The Treasury (2009) Guidance for public private partnerships in New Zealand.
- Ng, A. and Loosemore, M. (2007) Risk allocation in the private provision of public infrastructure. *International Journal of Project Management*, 25(1): 66-76.
- Nisar, T. (2007) Risk management in public-private partnership contracts. *Public Organization Review* 7(1): 1-19.
- OECD (Ed.) (2008) *Public-Private partnerships in pursuit of risk sharing and value for money*.
- Osborne, S. P. (2000) *Public private partnerships : theory and practice in international perspective*. London, New York: Routledge.
- Parliament of Victoria (2006) Report on private investment in public infrastructure, seventy first report to Parliament. Melbourne.
- Partnerships Victoria (2001) Guidance material overview.
- Partnerships Victoria (2003a) PSC Supplementary technical note.
- Partnerships Victoria (2003b) Use of discount rates in the Partnerships Victoria process.
- Pickrell, D. H. (1990) Urban rail transit projects: forecast versus actual ridership and cost. In US Department of Transportation. (Ed.). Washington, DC.
- Pollitt, M. (2002) The declining role of the state in infrastructure investment in the UK. In M. G. P. a. M. T. e. S. V. Berg (Ed.), *Private Initiatives in Infrastructure: Priorities, Incentives and Performance*. Aldershot: Edward Elgar.
- Pollitt, M. (2005) Learning from the UK private finance initiative experience. In G. H. a. C. G. (eds.) (Ed.), *The Challenge of Public-Private Partnerships: Learning from International Experience*. Cheltenham: Edward Elgar.
- Pollock, A., Shaoul, J., and Vickers, N. (2002) Private finance and value for money in NHS hospitals: a policy in search of a rationale? *British Medical Journal* 324: 1205-1208.
- Pollock, A., Price, D., and Player, S. (2005) The private finance initiative: a policy on sand, an examination of the Treasury's evidence base for cost and time overrun data in value for money policy and appraisal. London: UNISON.
- Pollock, A., Price, D., and Player, S. (2007) An examination of the UK Treasury's evidence base for cost and time overrun data in UK value-for-money policy and appraisal. *Public Money and Management* 27(2): 127-134.
- Quiggin, J. (2005) Public-private partnerships: options for improved risk allocation. *Australian Economic Review* 38(4): 445-450.
- Raymar, S.B., and Zwecher, M.J. (1997) Monte Carlo estimation of American call options on the maximum of several stocks. *The Journal of Derivatives* 5(1): 7-23.
- Roll, R. and Ross, S. A. (1980) An empirical investigation of the arbitrage pricing theory. *The Journal of Finance* 35(5): 1073-1103.
- Ross, S.A. (1976) The arbitrage theory of capital asset pricing. *Journal of Economic Theory* 13(3): 341-360.
- Sarmento, J.M. (2010) Do public-private partnerships create value for money for the public sector? The Portuguese experience. *OECD Journal on Budgeting* 2010(1): 93-119.
- Savas, E.S. (2000) *Privatization and public-private partnerships*. New York: Seven Bridges Press.
- Savvides, S.C. (1994) Risk analysis in investment appraisal. *Project Appraisal* 9(1): 3-18.
- Sawyer, M. (2005) The private finance initiative: the UK experience. *Research in Transportation Economic*, 15: 231-245.
- Scotia, N. (1997) Transferring risks in PPP. In Department of Finance (Ed.).
- Shaoul, J. (2002) A financial appraisal of the London Underground Public-Private Partnership. *Public Money and Management* 22(2): 53.
- Shaoul, J. (2005) A critical financial analysis of the Private Finance Initiative: selecting a financing method or allocating economic wealth? *Critical Perspectives on Accounting* 16(4): 441-471.
- Shaoul, J., Stafford, A., and Stapleton, P. (2006) Highway robbery? A Financial analysis of design, build, finance and operate (DBFO) in UK Roads. *Transport Reviews* 26(3): 257-274.
- Sharpe, W.F. (1964) Capital asset prices: a theory of market equilibrium under conditions of risk. *Journal of Finance* 19(3): 425-442.

- Sudong, Y. and Tiong, R.L.K. (2000) NPV-at-risk method in infrastructure project investment evaluation. *Journal of Construction Engineering and Management* 126(3): 227.
- Takashima, R., Yagi, K., and Takamori, H. (2010) Government guarantees and risk sharing in public-private partnerships. *Review of Financial Economics* 19(2): 78-83.
- Tallman, R.A.J.W. (2010) Lessons on risk transfer from Canadian public-private partnerships. *Review of Business Research* 10(4): 194-200.
- Tanaka, D.F., Ishida, H., Tsutsumi, M., and Okamoto, N. (2005) Private finance for road projects in developing countries: improving transparency through VFM risk assessment. *Journal of the Eastern Asia Society for Transportation Studies* 6: 3899-3914.
- Treasury of New Zealand. How to manage the delivery of long-term PFI contracts - Technical Note n° 6. In T. P. Finance (Ed.).
- Treynor, J.L. (1961) Market value, time, and risk. *Unpublished manuscript*.
- Vega, A.O. (1997) Risk allocation in infrastructure financing. *Journal of Project Finance*, 3(2): 38-42.
- Victorian Auditor-Generals Office (2007) Audits of 2 major partnerships Victoria projects.
- Victorian Auditor-Generals Office (2010) Audit summary of management of prison accommodation using public private partnerships.
- Victoria, P. 2001. Guidance material Overview.
- Victoria, P. 2003a. PSC Supplementary Technical Note.
- Victoria, P. 2003b. Use of Discount Rates in the Partnerships Victoria Process.
- Wang, S.Q., Tiong, R.L., Ting, S.K., and Ashley, D. (2000) Evaluation and management of foreign exchange and revenue risks in China's BOT projects. *Construction Management & Economics* 18(2): 197-207.
- Wang, S.Q., Tiong, R.L., Ting, S.K., and Ashley, D. (2000) Evaluation and management of political risks in China's BOT projects. *Journal of Construction Engineering and Management*, 126(3): 242-250.
- Weihe, G. (2008) Public-private partnerships and public-private value trade-offs. *Public Money and Management* 28(3): 153-158.
- Wells, L.T. and Gleason E. S. (1995). Is foreign infrastructure investment still risky? *Harvard Business Review*, September/October: 44-53.
- Ye, S. and Tiong, R.L. (2000) NPV-at-risk method in infrastructure project investment evaluation. *Journal of Construction Engineering and Management* 126(3): 227-233.
- Yescombe, E.R. (2011) *Public-private partnerships: principles of policy and finance*: Butterworth-Heinemann.
- Zarco-Jasso, H. (2005) Public-private partnerships: a multidimensional model for contracting. *International Journal of Public Policy* 1(1/2): 22-40.